

City of Gaithersburg  
**ENVIRONMENT**

**DRAFT**  
March 29, 2004

2004

# CITY OF GAITHERSBURG 2003 MASTER PLAN

## III. ENVIRONMENT

### TABLE OF CONTENTS

1.	INTRODUCTION _____	3
2.	BACKGROUND _____	4
3.	NATURAL ENVIRONMENT _____	5
3.1	Water Resources _____	6
3.2	Soils and Steep Slopes _____	19
3.3	Open Space and Greenways _____	23
3.4	Forests and Landscapes _____	28
3.5	Wildlife _____	41
3.6	Air Quality _____	44
4.	URBAN ENVIRONMENT _____	48
4.1	Smart Growth _____	48
4.2	Green Building _____	49
4.3	Sustainable Redevelopment and Historic Preservation _____	53
4.4	Noise Pollution _____	55
4.5	Light Pollution _____	56
4.6	Solid Waste and Recycling _____	58
5.	REFERENCES _____	61
6.	APPENDICES _____	64

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## 1. INTRODUCTION

The State of Maryland *Economic Growth, Resource Protection, and Planning Act of 1992 (Planning Act)* altered the way citizens of the State of Maryland address land use by focusing planning efforts toward growth management and resource protection. In order to help local jurisdictions integrate environmental protection with plans for physical growth, the Planning Act requires jurisdictions to develop a sensitive areas element of the Comprehensive Master Plan. This element is one of the broadest elements of the Comprehensive Plan, encompassing three of the seven visions of the Planning Act; in particular the protection of sensitive areas (Vision 2), stewardship of the Chesapeake Bay (Vision 4), and conservation of resources, including a reduction in resource consumption (Vision 5). Codified in Article 66B of the Annotated Code of Maryland, this element, at a minimum, is required to contain goals, objectives, principles, policies, and standards that are designed to protect sensitive areas, such as: streams and their buffers, 100-year floodplains, habitat of threatened and endangered species, and steep slopes. The Planning Act, in addition to protecting these four general categories of environmentally sensitive areas, also encourages local governments to identify and protect other natural resources unique to their jurisdiction.

In the City of Gaithersburg, the Environment Element of the Master Plan is intended to fulfill the sensitive areas requirements of the Planning Act as well as address the health of the urban environment and public welfare considerations. The term “public welfare” is used in a general context to encompass both human health and quality of life impacts. This element identifies the type and location of important environmentally sensitive areas (e.g., water and air resources, soils and steep slopes, open space and greenways, forests and landscapes, and wildlife) within Gaithersburg and devises management strategies to continually protect and enhance these natural resources. Furthermore, this element extends beyond the requirements of the Planning Act and the traditional notions of environmental planning by addressing the sustainability of the urban environment and the protection of public welfare by providing management recommendations for smart growth, green building, sustainable redevelopment and historic preservation, noise pollution, light pollution, and solid waste and recycling.

Gaithersburg realizes that all aspects of the natural environment and urban environment are interrelated. For instance, transportation affects air quality; air pollution affects water quality; impervious surfaces impact groundwater recharge and stream flows; and solid waste management affects air, land, and water quality. These impacts extend well beyond the City’s boundaries. Consequently, Gaithersburg must collaborate with regional authorities, such as Montgomery County and the metropolitan Washington Council of Governments to devise solutions. Gaithersburg recognizes that a plan for protecting and enhancing both the natural and urban environment, the Environment Element, is essential for protecting public welfare and ensuring a high quality of life for future generations.

## 2. BACKGROUND

There are numerous Federal, State, and local laws, policies, and regulations governing the environment. Appendix A provides a brief overview of the fundamental environmental regulations and policies guiding the planning process in Gaithersburg. Gaithersburg's City Code contains several local ordinances that are intended to protect and improve individual elements of the environment:

- ? Sediment and Erosion Control and Stormwater Management (Chapter 8);
- ? Floodplain Management (Chapter 10);
- ? Refuse and Garbage (Chapter 18);
- ? Trees and Vegetation (Chapter 21);
- ? Trees and Forest Conservation (Chapter 22); and
- ? Zoning (Chapter 24).

In 1995, Gaithersburg first employed a comprehensive view of the environment with the adoption of the *Environmental Standards*. These standards were designed to serve as guidelines in the development review process. However, it was determined that a more consistent and enforceable mechanism was needed to effectively protect the City's natural resources. Therefore in 2001, the 1995 standards were revised and adopted as the *Environmental Standards for Development Regulation, Regulation No. 01-01*. This regulation establishes an enforceable "benchmark" level of environmental protection, and any waiver of the standards requires approval by the Mayor and City Council. In effect, this regulation protects sensitive environmental areas during the development review process, as required by the *1992 Planning Act*.

Gaithersburg's first Master Plan Sensitive Areas Element was created in 1997 to identify and protect the City's sensitive environmental resources. As part of the 2004 Master Plan update, citizens and the Mayor and City Council developed an Environment Theme (located in the Themes section of the Master Plan) which contains a series of environmental goals and objectives relating to both the natural and urban environment. The Environment Theme indicated an apparent need for a more comprehensive environmental plan. Therefore, in the 2004 Master Plan update, the Sensitive Areas Element has been renamed the Environment Element, and now addresses the protection of sensitive areas, the health of the urban environment, and public welfare considerations.

Finally, the implementation of the Environment Element's recommendations, relates directly to Strategic Direction #9 found within *Strategic Directions: An Overall Approach To Achieving The Vision of The City of Gaithersburg*. This Strategic Direction states that the City will "[i]mplement recommendations from on-going evaluations of natural resources and encourage the protection and enhancement of the environment (streams, parks, stormwater management, and other Capital Improvement Projects (CIP))." Updated annually, the *Strategic Directions* establish goals and activities (e.g., CIP projects, the development of new plans or programs,

ordinance revisions, etc.), implementation schedules, and critical measures for assessing progress.

### 3. NATURAL ENVIRONMENT

This section provides an overview of the important natural environmental features (e.g., water and air resources, soils and slopes, open space and greenways, forests and landscapes, and wildlife) found within the City of Gaithersburg. Each of the subsequent sections follows a consistent format that: 1) defines the resource and explains why protection is important; 2) presents baseline geographic conditions; and 3) discusses management policies and strategies.

In summary, the City of Gaithersburg occupies approximately 10 square miles in the heart of Montgomery County, Maryland, and is home to over 56,000 residents. The City's main sensitive areas and environmental resources include public parks and open space, wetlands, lakes and stream valley buffers, urban forests, and sensitive soils and slopes. Table 1 provides a brief overview of the important natural environmental features found in Gaithersburg. Acreage calculations are based on the most recent Geographic Information System (GIS) data available. Given the rate of new development and the naturally fluctuating state of the environment, these numbers should only be considered as general approximations.

**Table 1: Summary of Gaithersburg's Environmental Resources**

Attribute	Acres	Percent <sup>1</sup>
City of Gaithersburg	6,403	100 %
Public Parks and Open Space <sup>2</sup>	719	11.23 %
Wetlands <sup>3</sup>	191	2.98 %
Floodplains <sup>4</sup>	451	7.04 %
Lakes and Stream Valley Buffers <sup>5</sup>	860	13.43 %
Publicly Owned	297	4.64 %
Privately Owned	563	8.79 %
Tree Canopy Coverage <sup>6</sup>	1,657	25.88 %
City-Owned (City-parks)	381	5.95 %
Privately Owned	1,276	19.93 %
Erodible/Hydric Soils <sup>7</sup>	1,543	24.1 %
Steep Slopes <sup>8</sup>	297	4.64 %
Impervious Area <sup>9</sup>	2,059	32.16 %

<sup>1</sup> Due to overlapping attributes and the exclusion of developed land, percentages are not cumulative.

<sup>2</sup> Includes State, County, and City-owned parks and open space.

<sup>3</sup> National Wetlands Inventory, 1995.

<sup>4</sup> Federal Emergency Management Agency; based on 1979, 1984, 1991, and 1992 panel data.

<sup>5</sup> Includes lakes, streams, and 100 foot stream valley buffer (minimum). M-NCPPC, 1999.

<sup>6</sup> M-NCPPC tree cover analysis, 1999.

<sup>7</sup> 1995 Soil Survey Geographic (SSURGO) database for Montgomery County

<sup>8</sup> M-NCPPC planimetric topographic elevation contours.

<sup>9</sup> Impervious land cover analysis by University of Maryland and Montgomery County, 1999.

### 3.1 Water Resources

Water resources include streams, lakes, ponds, drainage courses, floodplains, groundwater resources, aquifers, wetlands, and riparian stream buffers. These resources provide numerous benefits and should be protected and enhanced.



**Figure 1** The lakes of Kentlands and Lakelands enhance the natural beauty of the area, as well as provide valuable community amenities such as outdoor activity.

- ? **Surface water resources**, such as lakes, rivers, and streams, add beauty and diversity to the landscape, enhance the value of the property, provide recreational opportunities, serve as valuable habitat for plants and animals, and supply our drinking water.
- ? **Wetlands** play an important role in protecting water quality by trapping sediment, storing nutrients, and removing contaminants from surface water. Wetlands also serve as water storage areas, provide flood control, and supply habitat for a wide variety of plants and animals.
- ? **Groundwater resources** play an important role in the hydrological cycle and supply water for wells and springs. Although groundwater resources are not commonly associated with drinking water aquifers in Gaithersburg, groundwater is important due to its connection to surface water. During dry times of the year, groundwater feeds many of our perennial streams, thus sustaining aquatic ecosystems and surface drinking water supplies.
- ? **Riparian stream buffers** are the bands of moisture-loving vegetation growing along the edge of natural water bodies that serve as the transition zone between aquatic and upland vegetation. These areas slow or alleviate floods, recharge groundwater, stabilize stream banks, trap sediment eroded from upland areas, and remove nutrients and other contaminants from runoff before they reach the stream. Riparian areas also serve as shelter, nesting, and foraging sites that are critical habitat for wildlife.
- ? **Watersheds** include the geographic areas that drain to any given body of water. Watersheds supply our drinking water, provide critical habitat for plants and animals, serve as areas of natural beauty, and support recreation. Since watersheds intersect jurisdictional boundaries and ultimately affect the health of the Chesapeake Bay, it is important that local and regional governments coordinate watershed protection strategies.

## Baseline Conditions

As illustrated in Map 1, Gaithersburg contains over 24 miles of predominately first and second order perennial streams located in the Muddy Branch Watershed (2,985 acres) and the Great Seneca Watershed (3,418 acres). These streams ultimately drain into the Potomac River and then into the Chesapeake Bay. Map 2 presents Gaithersburg's major tributaries and water resources, including: 1) Muddy Branch, 2) Long Draught Branch, 3) Whetstone Run, and 4) Seneca Creek. Approximately 191

acres of nontidal wetlands are found interspersed along these stream valleys. Additionally, there are approximately 20 man-made lakes and ponds scattered throughout Gaithersburg. Unfortunately, in many of these lakes, the water quality is impaired by excess sediment loading and nutrient runoff. These factors can lead to

eutrophication, a condition that occurs in an aquatic ecosystem when high nutrient concentrations (primarily phosphorus, nitrogen, and carbon) stimulate algae blooms that deplete oxygen and result in fish kills. For example, Clopper Lake, an impoundment on Long Draught Branch located within Seneca Creek State Park, near Gaithersburg, was identified on Maryland's 1998 list of Water Quality Limited Segments (WQLSs) as being impaired by sediment and phosphorus loading.

In order to comply with Federal and State regulations and Montgomery County stream monitoring guidelines, the City recently completed a stream assessment to:

- ? Update the stream assessment performed in 1996 by EQR in order to determine improvements or degradation in stream quality.
- ? Assess water quality and stream health, using monitoring protocols for physical habitat, biology, and water chemistry, consistent with Montgomery County and the State of Maryland protocol to facilitate data sharing and comparison.
- ? Identify potential stream restoration sites throughout the City, helping to prioritize restoration projects and efficiently utilize limited funds.
- ? Identify potential citizen stream monitoring sites where citizens can perform biological and chemical monitoring thus increasing community watershed awareness and fostering a continuous monitoring program.



**Figure 2** This Muddy Branch tributary is an example of “good” stream habitat. The stream is surrounded by a riparian forest buffer to provide shade and habitat; the banks are relatively stable and contain vegetation and fish cover; and there are riffles present to facilitate aeration.



Map 1: Sub-Watersheds

# Draft Environment Element Sub-Watersheds

1 inch equals 3,145 feet

1,500 750 0 Feet

500 250 Meters



MD State Plane  
HPGN NAD 83/91

## Legend

City Boundary

Streams

Lakes

Roads

Great Seneca  
Sub-watersheds

Muddy Branch  
Sub-watersheds

Great Seneca  
Sub-watersheds

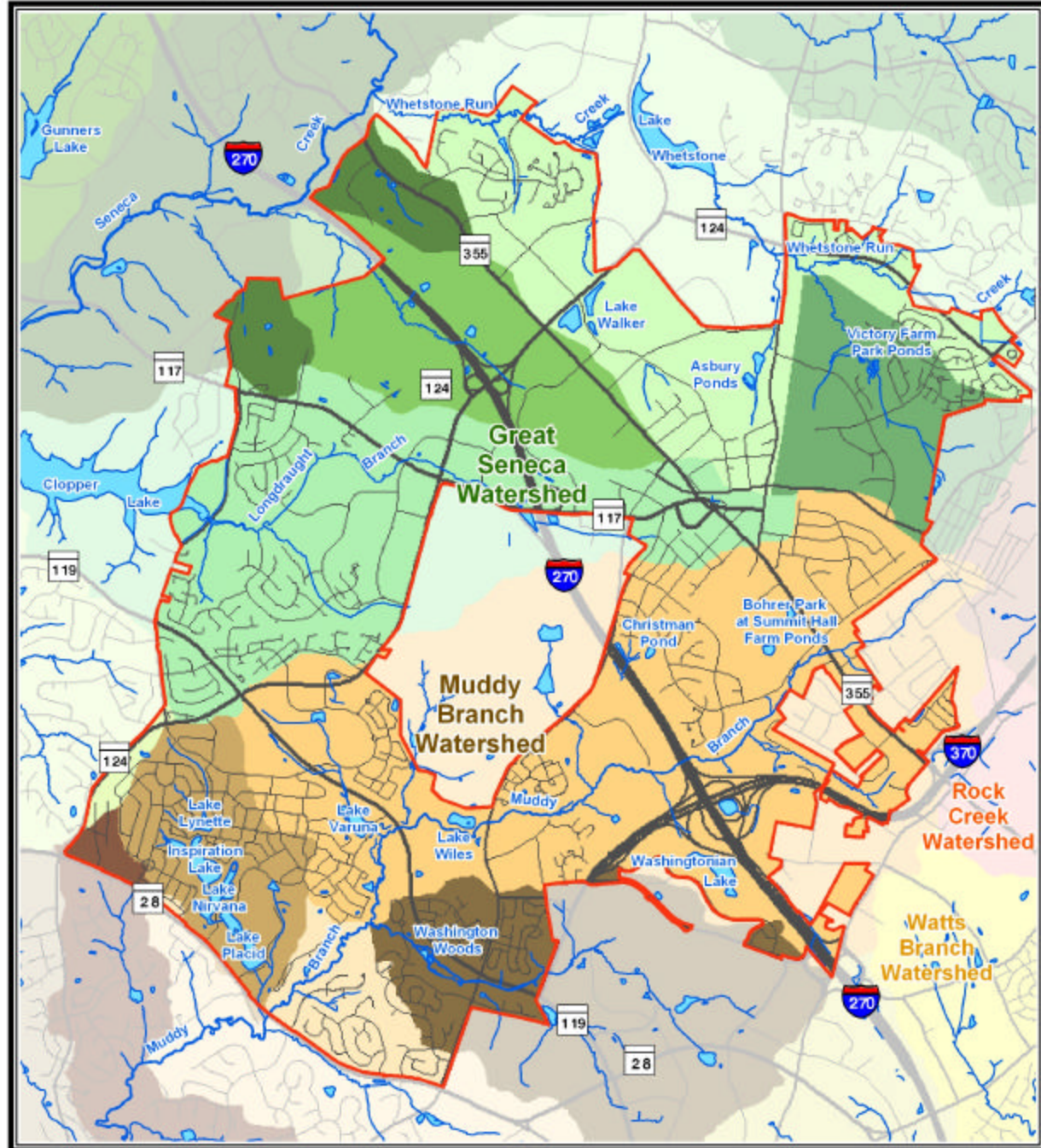
Muddy Branch  
Sub-watersheds

Wetlands and FEMA Floodplains ©2003 MD Dept  
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## Map 2: Water Resources

### Draft Environment Element Water Resources

1 inch equals 3,138 feet  
1,500 750 0 1,500 Feet  
500 250 Meters



WaterResources.mxd - 25-March-2004 - jba/ias

#### Legend

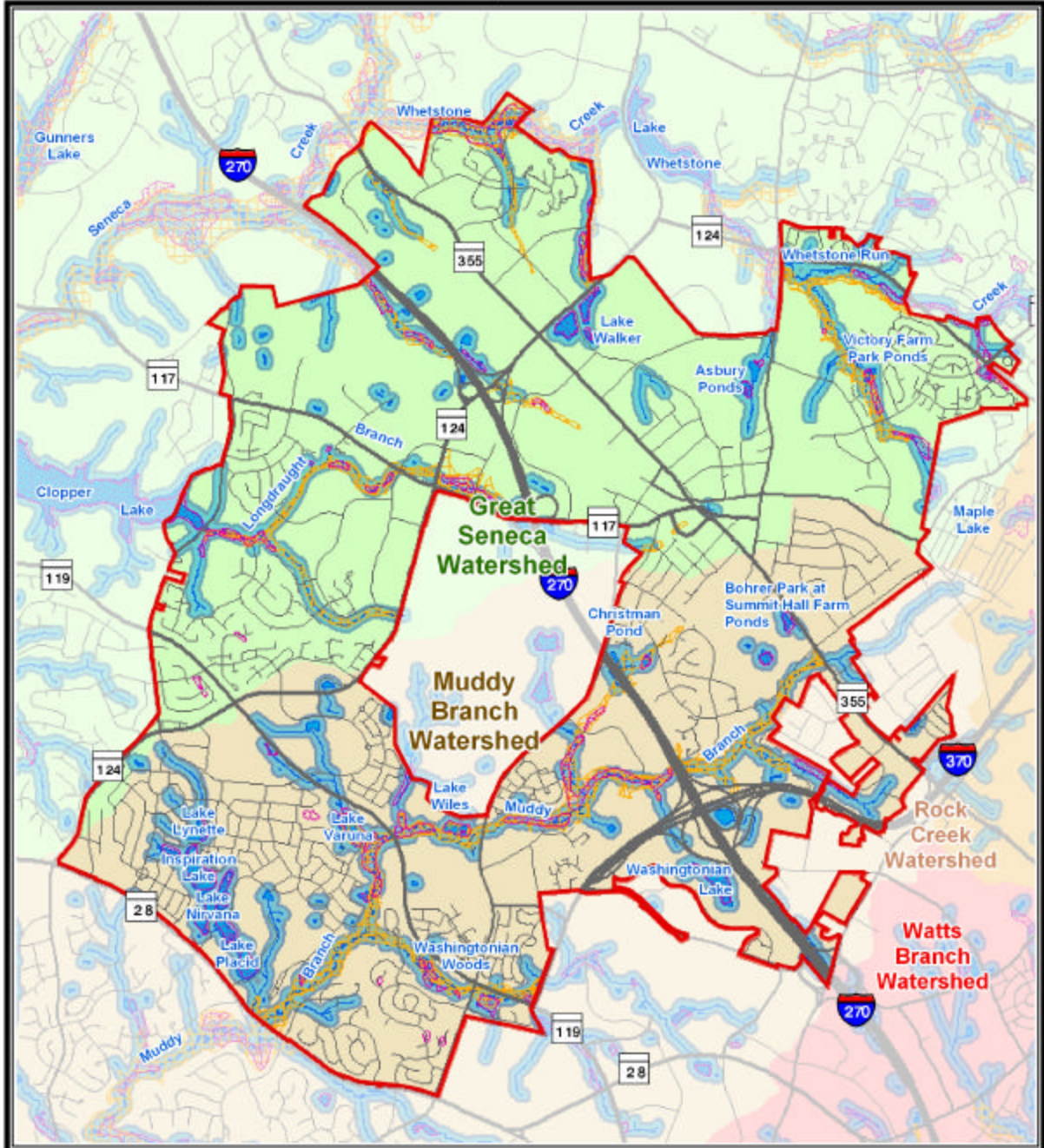
- City Boundary
- Roads
- Wetlands
- 100-year Floodplain
- Streams
- Lakes
- 150-ft Stream Valley Buffer
- Great Seneca Watershed
- Muddy Branch Watershed

NWI Wetlands and FEMA Floodplains ©2003 MD Dept of Natural Resources. Planimetric base map, including roads, lakes, and streams. ©2003 MNCPPC and City of Gaithersburg. All rights reserved.

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The stream assessment's methodology and results were recorded by Versar Inc., and are in the report titled *An Ecological Assessment of Streams in Gaithersburg, Maryland: 2001-2002*. The assessment concluded that urban development (i.e., increased imperviousness, uncontrolled stormwater, and inadequate buffers) has severely degraded the City's watersheds and streams. The stream assessment sampled a total of 17 sites that were either selected at random or targeted by the City as a special area of concern. The sites were sampled throughout the year and evaluated according to a combination of physical and biological parameters. Generally, physical habitat degradation is an extensive problem; especially in areas of the City that lack or have inadequate stormwater controls. Uncontrolled storm runoff contributes to bank instability, channel incision, high sedimentation, and excessive channel widening. Other problems include inadequate stream buffers, invasive species, litter, and poor water quality. Table 2 summarizes the stream assessment ratings for physical habitat, benthic macroinvertebrate indices of biologic integrity (IBI), and fish indices of biologic integrity (IBI). As indicated in Table 2, the majority of streams sampled are classified as Fair or Poor condition. Map 3 provides a geographical depiction of the stream monitoring results. This map highlights streams rated as Good and Fair condition in need of protection and the sites rated as Poor and Very Poor condition that considered candidate enhancement sites.



**Figure 3** Important components of stream monitoring, habitat assessment (on left) and benthic macroinvertebrate sampling (on right), help to determine the physiological and biological health of a stream. These characterize stream health and water quality under present conditions and establish a baseline for evaluating future conditions as new developments are built.

**Table 2: 2002 Stream Monitoring Results**

<b>Rating</b>	<b>Physical Habitat (percent of sites)</b>	<b>Benthic Macroinvertebrate Indices of Biotic Integrity (IBI) (percent of sites)</b>	<b>Fish Indices of Biotic Integrity (IBI) (percent of sites)</b>
Good	18 %	0 %	0 %
Fair	24 %	6 %	18 %
Poor	41 %	76 %	24 %
Very Poor	12 %	18 %	24 %
Not Rated	6 %*	0 %	35 %**

City of Gaithersburg, 2002.

\*Stream monitoring sites were included in the assessment after physical habitat monitoring commenced; therefore consistent spring, summer, and fall data were not available to determine a rating.

\*\*Catchment areas were too small (less than 300 acres) to support significant fish populations.





**Figure 4** Excessive stream bank erosion and channel downcutting along a tributary of the Muddy Branch creates a high priority stream restoration candidate site.

The stream assessment identified and ranked approximately 52 **candidate stream restoration sites** based on several criteria (e.g., protection of public safety, property and infrastructure, environment and stream habitat; economic feasibility; and probability of success, etc.). Map 4 illustrates the stream restoration candidate sites. Sites labeled as “Very Good” are considered a high priority since there is a dear need for restoration and a high probability of success. Sites labeled as “Good” or “Moderate” indicate lower priority restoration opportunities. Although these rankings are based on a number of

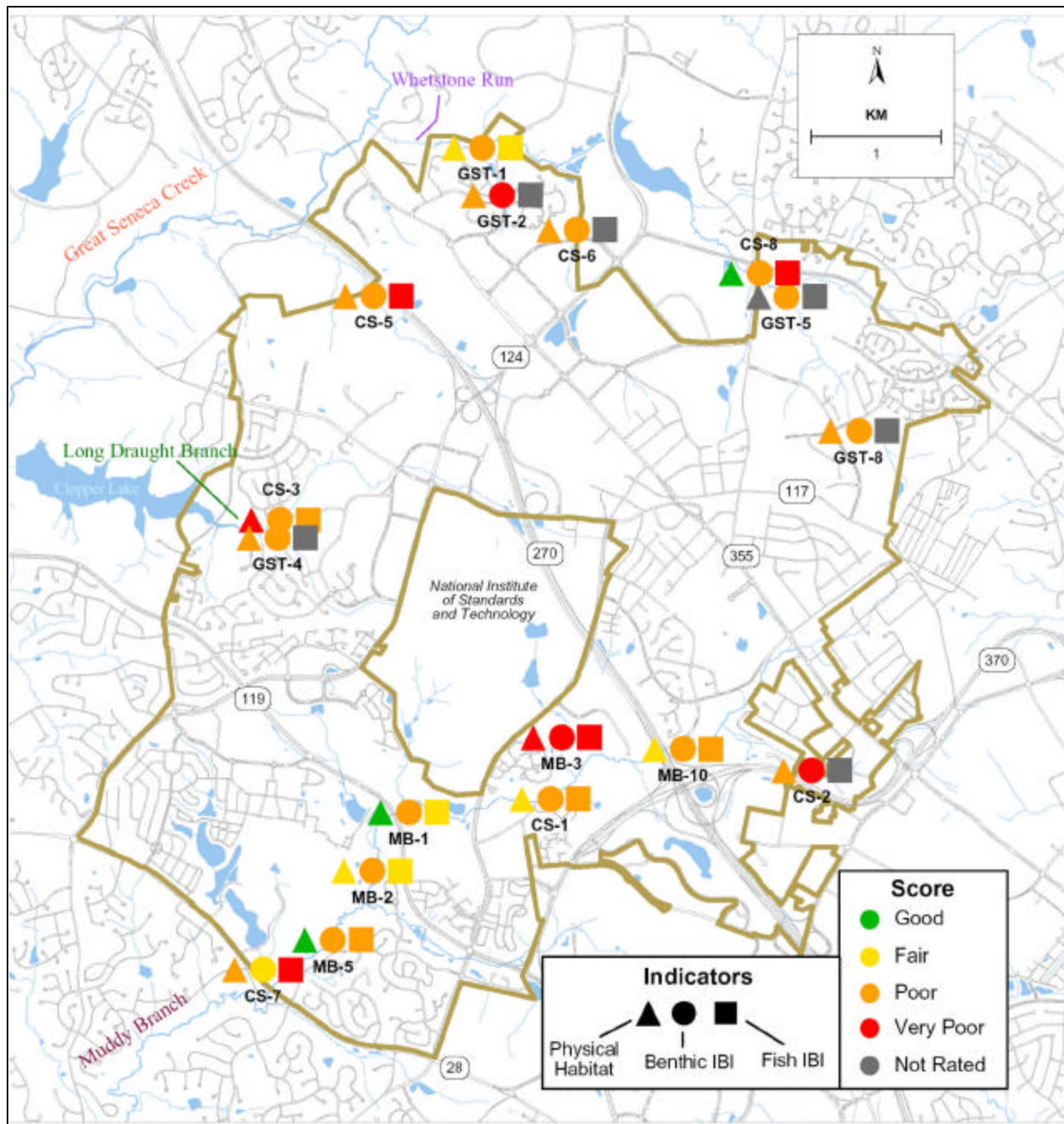
technical factors, it is anticipated that the continuously changing nature of stream conditions and other important factors may modify these rankings.

The stream assessment affirmed that the City’s **stormwater management (SWM)** system performs an essential role in mitigating the effects of development on streams and surrounding environmentally sensitive areas. Gaithersburg’s public and private storm drain system consists of over 3,600 inlets, approximately 100 linear miles of pipe, over 500 outfalls, and over 300 SWM best management practices (BMPs); including wet ponds, dry ponds, infiltration trenches, underground quantity control structures, and water quality inlets. The stream assessment concluded that the City should ensure that properly functioning SWM structures are maintained, older SWM structures are retrofitted to better manage stormwater flows, and new SWM structures are created in older areas with inadequate SWM controls.



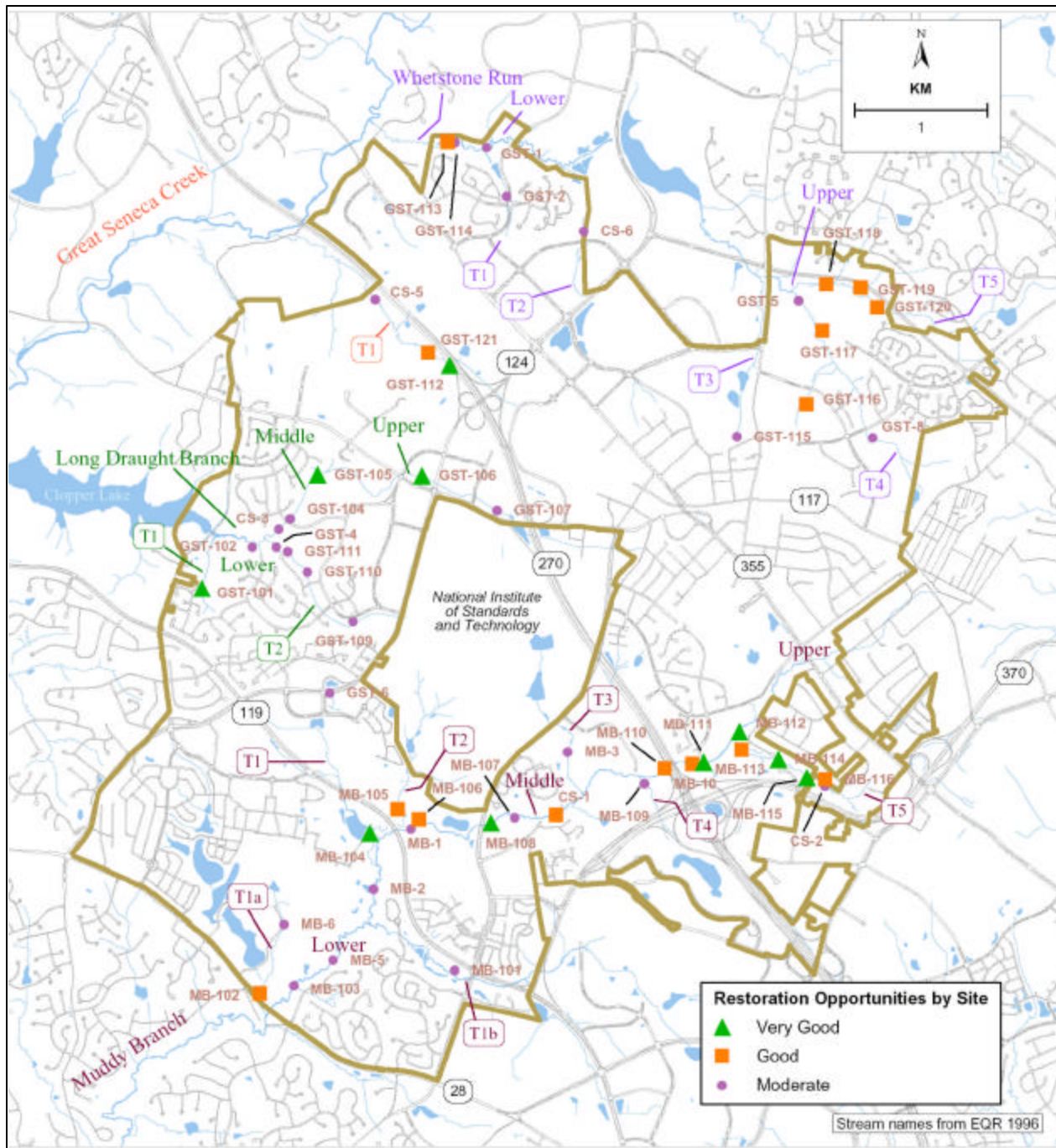
**Figure 5** The stormwater management pond in Quince Orchard Park treats runoff, provides wetland habitat, and serves as a community amenity.

### Map 3: 2002 Stream Assessment Results



City of Gaithersburg, 2002. *An Ecological Assessment of Streams in Gaithersburg, Maryland: 2001-2002*





## **Watershed Protection and Enhancement Strategies**

There are several important State and Federal regulatory measures aimed at protecting water resources in Gaithersburg:

- ? As required by the Federal Clean Water Act (CWA), the Maryland Department of the Environment (MDE) established a State Water Use Classification and Anti-degradation Policy for streams throughout the state. Streams in Gaithersburg are classified as *Use I-P: Water contact recreation, protection of aquatic life, and public water supply*. Streams in this category should be suited for water contact sports; play and leisure time activities where the human body may come in direct contact with the surface water; fishing; the growth and propagation of fish (other than trout), other aquatic life, and wildlife; agricultural water supply; industrial water supply; and public water supply.
- ? MDE also established a Total Maximum Daily Load (TMDL) for phosphorus and sediment entering Clopper Lake. Municipalities, including Gaithersburg, within Clopper Lake's watershed are required to focus on improving water quality by reducing sediment and nutrient loads. Future watershed protection efforts for tributaries of Long Draught Branch, draining into Clopper Lake, should concentrate on reducing sediment and nutrient loads and increasing opportunities for nutrient uptake.
- ? Under the Clean Water Act, another important Federal regulation affecting water resources in Gaithersburg is Phase II of the National Pollutant Discharge Elimination System (NPDES) Stormwater Program. Under Phase II, the City is required to obtain a permit from MDE to control flows from the municipal separate storm drain system.

In addition to Federal and State regulations, local policies are also important components of a watershed protection program. The following outlines basic strategies to protect watersheds and water resources.

### ***Watershed Assessment and Planning***

- **Partner with outside organizations, such as the U.S. Army Corps of Engineers and Montgomery County Department of Environmental Protection, to conduct watershed feasibility studies of Great Seneca and Muddy Branch. The watershed studies will provide an in-depth analysis of land use, watershed conditions, impervious cover, and the adequacy of stormwater management controls in order to prioritize and design stream restoration and stormwater management retrofit projects.**
- **Develop a prioritization and funding schedule for stream restoration and stormwater management retrofit CIP projects identified in the 2002 stream assessment, watershed feasibility studies, and stormwater management inspections.**

- Whenever possible, incorporate bioengineering techniques in stream stabilization designs in order to restore the stream's pattern (bends and meanders), dimension (width, depth, and shape), profile (bed slope), and floodplain connection.
- Seek grant funding from the MDE and other organizations to fund restoration and retrofit projects.
- Continue to fund professional stream assessments, similar to the studies conducted in 1996 and 2002, to detect ecological degradation or recovery.

#### ***Land and Riparian Buffer Conservation***

- During the development review process, continue to require new developments to establish conservation easements to protect stream valley buffers, forests, and other sensitive environmental areas; as stipulated in the *Environmental Standards* and *Forest Conservation* ordinances.
- Continue to enforce the 100-150 foot stream valley buffer setbacks.
- Utilize Program Open Space Funds and other grants to purchase lands to protect environmentally sensitive areas.
- Maintain and enhance riparian buffers on public lands by planting native vegetation along unforested buffers and increasing "no mow" zones.
- Obtain grants to conduct community-based riparian buffer restoration projects.
- Identify options (public-private partnerships, technical assistance, etc.) to improve riparian buffers on private property.
- Improve the City's stream buffer and conservation easement programs by increasing public education, delineating conservation areas, and enforcing existing regulations in order to prevent dumping and encroachment upon these areas.

#### ***Better Site Design***

- Reevaluate green space, landscape, roadway, forest conservation, stormwater management, and other zoning requirements to promote low impact development (LID). The intention of LID is to produce innovative site designs that preserve vegetation, minimize impervious surfaces, maximize sheet flow and groundwater infiltration, and decrease the heat island effect on stream temperatures. Potential ordinance modifications involve increasing green space requirements, requiring parking lot and roof shading, disconnecting roof top runoff, clustering development, and incorporating "headwater streets" in design requirements.

- Discourage waivers involving stream, wetland, floodplain, or buffer encroachments, stormwater management quantity control requirements, forest conservation requirements, and open space requirements.

### ***Erosion and Sediment Control***

- Continue to reassess, per the NPDES Phase II Permit, structural and non-structural erosion and sediment control requirements; the plan review process including minimal acceptable standards; and inspection procedures to determine if current practices are effectively protecting water quality and habitat in City streams.

### ***Stormwater Management***

- Per the NPDES Phase II Permit, continue to implement, enforce, and improve Gaithersburg's stormwater management program; including implementing MDE's 2000 Stormwater Design Manual, Chapter 8 of the City Code, and the *Environmental Standards*.
- Inspect public and private aboveground and underground stormwater management structures and require maintenance and repairs as necessary (e.g., removal of trees and shrubs on dam embankments, "mucking out" of sediment and grit, removal of trash and debris, mowing, fencing, etc.).
  - Require commercial properties to perform necessary SWM maintenance and repairs.
  - Develop a Homeowner Association (HOA) SWM technical and cost assistance program to support major SWM maintenance and repair projects. Residential property, held in common ownership by HOAs, is generally not adequately financed for large costly SWM maintenance and repair projects; therefore, a program is needed to prioritize and provide financial and technical support. Due to the requirements of Montgomery County's Water Quality Protection Charge, this program should also provide the HOA with the option to transfer the structural maintenance responsibility to the City. The transfer will occur after the HOA makes the necessary repairs to bring up the structure up to "as built" conditions. Thereafter, the HOA will continue to perform regular maintenance (mowing, trash removal, etc.) and the City will perform structural maintenance.
  - Continue to develop a maintenance and repair prioritization and funding schedule for publicly-owned SWM systems.
- Improve existing structures and add new structures in areas of the City that lack SWM.

- Utilize stream assessments, watershed assessments, and inspection results to develop a prioritization and funding mechanism to improve SWM in areas lacking appropriate controls. Support the maintenance and performance of existing stormwater management structures through a multi-year City Capital Improvements Program.
- Require redevelopment to upgrade SWM controls; especially in older areas of the City that lack adequate SWM.
- Require developers to complete stream restoration and stormwater management retrofit projects that are critical to improving the condition of streams and watersheds; especially in areas identified in stream assessments and watershed studies.

### ***Pollution Prevention***

- Per the NPDES Phase II Permit requirements, continue to develop and implement a plan to detect and eliminate illicit discharges into the storm drain system (e.g., sanitary wastewater, effluent from septic tanks, car wash wastewaters, improper oil disposal, radiator flushing disposal, laundry wastewaters, dry cleaning solvents, spills from roadway accidents, and improper disposal of auto and household toxics). Components of this plan include partnering with adjacent communities to investigate and resolve problems, promoting public education, updating the GIS-based storm sewer map, developing a GIS-based spills tracking system, and continuing to promote used oil and household hazardous waste collection and disposal programs.
- Update the City's Environmental Management System (EMS) to prevent and reduce pollutant runoff from all municipal operations.
- Encourage the reduction of fertilizer and pesticide runoff through the use of Integrated Pest Management (IPM).

### ***Watershed Stewardship***

- Develop and promote a public education campaign on the impact polluted stormwater runoff discharges have on water quality.
- Utilize citizen volunteers to conduct stream monitoring in order to promote education, identify problems that may otherwise go undetected, and supplement information collected by professional organizations.
- Organize community watershed enhancement projects (e.g., stream cleanups, Community Cleanup Day, stream monitoring, storm drain stenciling, tree plantings, rain gardens, etc.).
- Seek grant funding supporting community based education and restoration projects.



### 3.2 Soils and Steep Slopes

Different soil types possess dramatically different properties (e.g., texture, structure, and strength) and consequently demonstrate varying abilities to support development. Soil characteristics causing limitations to development include low permeability, high flood susceptibility, high shrink/swell potential, high susceptibility to erosion, and shallow depth to bedrock. Steeper slopes amplify the risk of costly hazards and therefore limit use and development. Identifying and protecting these vulnerable soils and steep slopes is important for a variety of public safety and environmental reasons.



**Figure 6 Steep slopes and erodible soils hydraulically adjacent to streams, as indicated in the above photo of the Muddy Branch, illustrate why these are sensitive areas in need of special protection.**

- ? Highly erodible soils and steep slopes, especially those adjacent to watercourses, are often associated with flooding, erosion, water quality deterioration, and aquatic ecosystem damage. Appropriate protection and land use considerations should be given to areas prone to geologic and hydrologic hazards.
- ? Sites containing sensitive soils and steep slopes present development limitations and construction challenges. Proper structural engineering and construction techniques are required to prevent environmental degradation and ensure the safety of buildings and infrastructure.
- ? Historically, sites containing poor soils and steep slopes are difficult to farm, log, and develop. Consequently, they tend to remain undisturbed and have a propensity to develop unique, diverse plant and animal communities that should be protected.
- ? Protection of the natural topography and unique geologic areas often provides aesthetically pleasing open spaces.

## Baseline Conditions

Gaithersburg lies in the physiographic region known as the Piedmont Province. The Piedmont is characterized by gently rolling and hilly topography. Upland soils in this region, those outside of stream valleys, are generally suited for development on flat topography. The greatest limitations to development in upland areas are the slope of the land, the degree of soil erodibility, and the depth to bedrock.

Soils presenting the most significant limitations to development are found in the stream valleys. The vast majority of hydric (wetland) soils occur in the stream valleys, and present severe structural engineering limitations due to severe wetness, seasonal flooding, and high erodibility. Development in these areas is essentially restricted by Federal, State, and City regulations designed to protect these fragile riparian ecosystems.

Table 3 provides a list of erodible soils within Gaithersburg classified as having a severe hazard of erosion by the Natural Resources Conservation Service (NRCS). These soils should be incorporated into the property's open space and carefully managed during construction. Map 5 illustrates where soils of concern and steep slopes are present and require special protection measures. This map is based on general data from the 1995 Montgomery County Soil Survey; certain sites within the City may require a geotechnical study and further analysis to determine if limitations to development exist.

**Table 3: Erodible Soils Within Gaithersburg**

16D	Brinklow-Blocktown channery silt loams, 15 to 25% slopes
18E	Penn silt loam, 15 to 45% slopes, very stony
21D	Penn silt loam, 15 to 25% slopes
21E	Penn silt loam, 25 to 45% slopes
21F	Nestoria-Rock Outcrop Complex, 25 to 50% slopes
57D	Chillum silt loam, 15 to 25% slopes
61D	Croom gravelly loam, 15 to 25% slopes
61E	Croom gravelly loam, 25 to 40% slopes
109E	Hyattstown channery silt loam, 25 to 45% slopes, very rocky
116E	Blocktown channery silt loam, 15 to 25%, very rocky

Source: U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), *1995 Survey of Montgomery County, Maryland*

## Map 5: Soils and Slopes

## Draft Environment Element

### Soils and Slopes

1 inch equals 3,087 feet  
1,500 750 0 1,500 Feet  
500 250 Meters

MD State Police  
HPGN NAD 83/91

Soils and Slopes noted 25-March-2004 - jfe:cas

### Legend

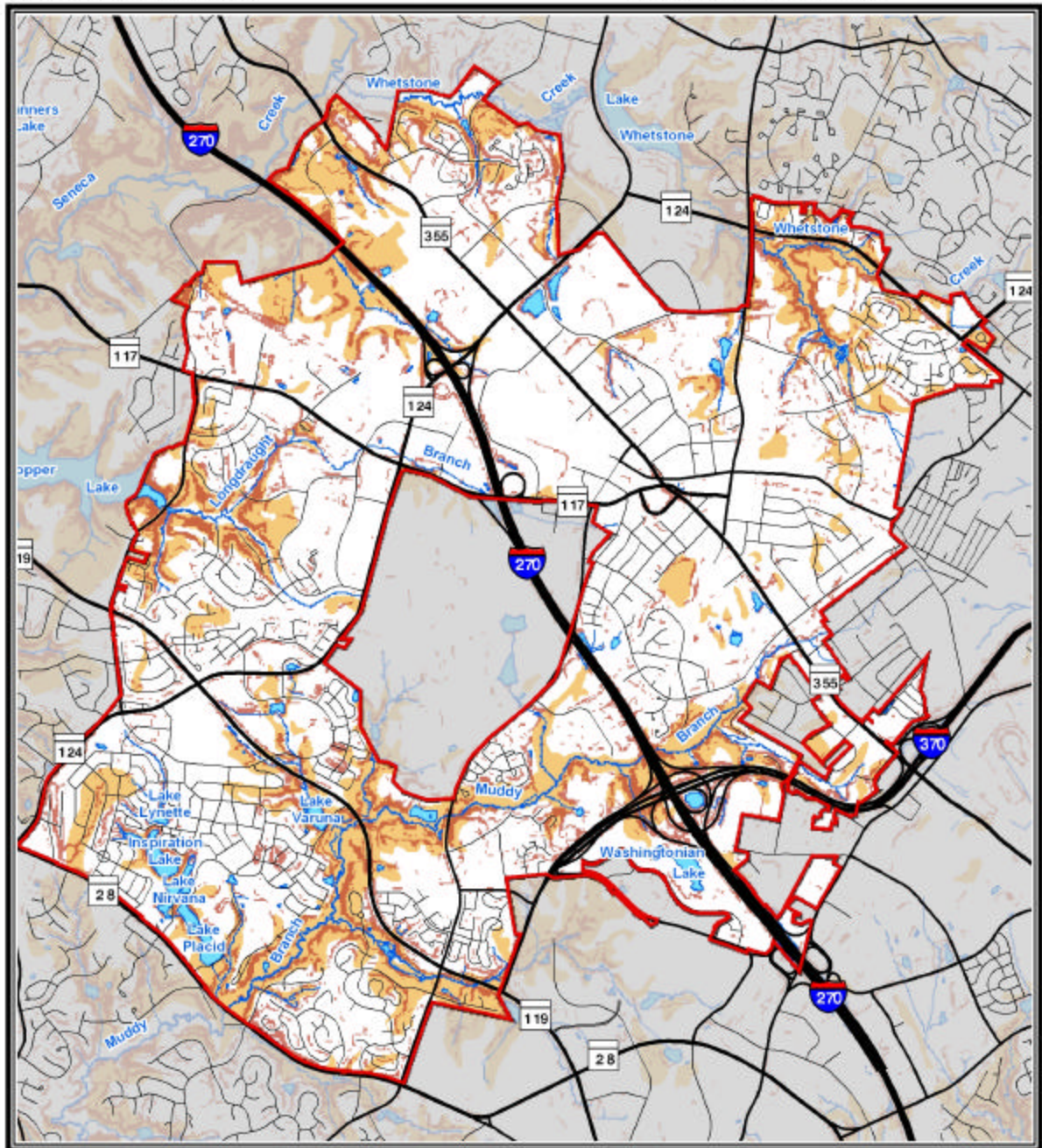
-  City Boundary  
 Roads  
 Streams  
 Lakes  
 Steep Slopes (>15%)  
 Soils of Concern  
 (i.e., hydric or erodible)

Soils information ©2003 US Department of Agriculture (Soil Survey Geographic)  
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## **Soil and Slope Protection Strategies**

Identification and protection sensitive soils and steep slopes will help to protect Gaithersburg and downstream communities from hazards and costly maintenance. The following strategies should be employed to protect soils and steep slopes:

- **Continue to implement the *Environmental Standards* to identify and protect steep slopes and erodible soils during the development review process. When such areas are identified, they should be incorporated into the site's open space, protected with conservation easements, and carefully managed during construction.**
- **If development on sensitive soils or steep slopes cannot be avoided, a geotechnical study must be prepared to protect against development hazards. The site design should minimize disturbance to these areas, incorporate special construction measures as identified in the geotechnical report, and involve the maximum use of erosion and sediment control measures during construction until the site is stabilized.**
- **In addition to protecting existing steep slopes, it is also important not to create new steep slopes and extensive retaining walls during development; especially within or near the stream valley buffer. Man-made steep slopes and retaining walls often present potential future concerns for safety, maintenance, and mowing. Whenever possible, slopes should not be created that exceed the 3:1 guidelines for safe and efficient mowing and maintenance. Fences should be constructed in cases where public safety is of concern.**
- **Stabilize steep slopes and erodible soils as soon as practicable by planting and maintaining appropriate vegetation.**

### 3.3 Open Space and Greenways



**Figure 7 Picnic pavilions, open space, ponds, and recreation pathways at Bohrer Park at Summit Hall**

Open space and greenways consist of both public and private lands in cities, suburbs, and rural areas. Smart growth uses the term **open space** broadly to mean parks, woodlands, and other natural areas. These areas function as important community space, critical environmental areas, plant and animal habitat, recreation sites, agricultural lands, and places of natural beauty.

**Greenways** are protected corridors of open space connecting environmental,

cultural, historic, and recreational resources. Some greenways are pristine corridors that provide habitat and safe passage for animals and plants; others are trails for hikers and bikers that are designed for recreational use. Greenways may include a protected streambed, a forested corridor, a ridgeline, a stream valley park, or a converted railroad or utility right-of-way. This interconnected network of open space and greenways comprises Gaithersburg's **green infrastructure** that supports natural systems and contributes to our community's health and quality of life.

The preservation and management of the quality and supply of open space and greenways provides numerous fiscal, recreational, and environmental benefits that enhance our quality of life. Such benefits include:

- ? providing recreation opportunities;
- ? increasing local property values;
- ? preserving habitat and migratory corridors for plants and animals that support biodiversity;
- ? protecting areas of natural beauty;
- ? providing connections between City neighborhoods and reducing automobile dependency; and
- ? providing other indirect environmental benefits such as protecting water quality, storing water for flood control, mitigating air pollution, attenuating noise, controlling wind, providing erosion control, and moderating temperature.



## Baseline Conditions

Map 6 illustrates Gaithersburg's existing open space and greenway network; including State and County parks, City-owned lands, privately-owned open space, and existing and proposed bikeways and pedestrian trails. Gaithersburg's greenways commonly follow stream valleys; providing important regional connections between Gaithersburg and the Potomac River.

? The **Muddy Branch Greenway**

is the City's most extensive open space and greenway system. This greenway contains Bohrer Park at Summit Hall Farm, Morris Park, Malcolm King Park, Izaak Walton League conservation areas, and City-owned parcels within Washingtonian Woods and Lakelands. Extending outside of the City, this greenway connects to Muddy Branch Park and Blockhouse Point Park and ultimately reaches the Potomac River.



**Figure 8 Duvall Park, located at the end of Holly Drive off of Gaither Street, contains three acres of recreational areas and woodlands.**

? The **Seneca Creek Greenway**

contains another large open space and corridor network. Beginning with the 21 acre parcel of City-owned parkland known as Casey-West, it follows a Seneca Creek tributary through a mixture of agriculture and forested lands in the Casey-Metropolitan Grove Study Area, west of Interstate 270. The greenway network continues to Seneca Creek State Park until it reaches the Potomac River. The protection of open space and the creation of a greenway path network in this area is an important priority to be considered in plan review for future development.

? The **Whetstone Run Greenway** occurs along two tributaries within the City. One greenway begins in Maple Lake Park in Washington Grove, runs through Kelley Park and Victory Farm Park, and extends north to Forest Oak Middle School. The second greenway begins at Watkins Mill Pond, continues through Blohm Park, and connects to Seneca Creek State Park.

? The **Long Draught Greenway** consists of Diamond Farms Park and Robertson Park and connects to Seneca Creek State Park.

? There are several sub-greenways within the City providing important transportation connections between various neighborhoods throughout the City. Additional information about these resources is provided in the *Bike and Pedestrian* and *Community Facilities* elements of the Master Plan.

## Map 6: Parks, Trails and Greenways

### Draft Environment Element Parks, Trails & Greenways

1 inch equals 3,245 feet

1,500 750 0 750 1,500 Feet

500 250 Meters



MD State Plane  
HPGN NAD 83-91

#### Legend

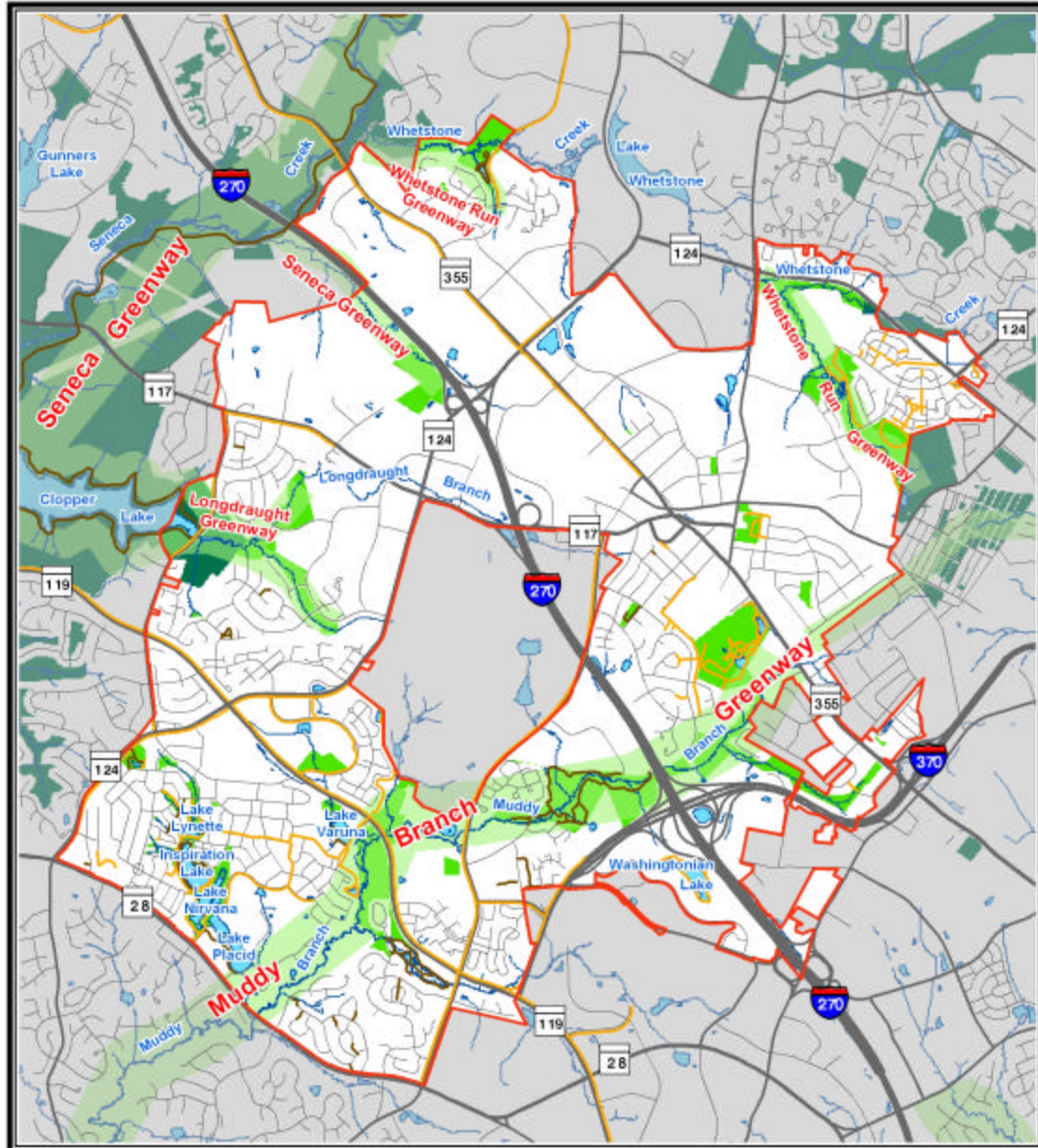
- City Boundary
- County Roads
- Trails
  - Paved
  - Natural
- Parks
  - City of Gaithersburg
  - Other Municipalities
- Greenways

Trails ©2003 City of Gaithersburg. Greenways courtesy of MD Dept. of Natural Resources. Planimetric base map, including roads, slopes, and topography, ©2003 M-N-T-P-C and City of Gaithersburg. All rights reserved.

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## Open Space & Greenway Protection and Enhancement Strategies



**Figure 9** Little Quarry Park provides a prime example of a “pocket park” tucked into a secluded woodland in the Kentlands neighborhood.

The development of a comprehensive open space and greenway network frequently involves multiple jurisdictions. Therefore, sharing information on future plans, progress and known obstacles is essential for developing an extensive connected system. Gaithersburg will continue to work with regional and state governments, citizen groups, and private organizations to coordinate efforts to preserve and establish new open space and greenway corridors with linkages to the regional network. Greenway plans will emphasize connections to many destinations within and around

Gaithersburg; including parks, community centers, schools, commercial centers, and public transportation centers. Challenges to developing an open space and greenway network include: 1) maintaining and enhancing existing resources; 2) identifying and prioritizing new lands needed to protect sensitive areas; 3) satisfying park and recreational needs; and 4) securing critical trail and pathway linkages. The following are strategies to protect, enhance, and promote Gaithersburg’s open space and greenway network:

- **Ensure that new residential development has sufficient and appropriate recreation land and open space to meet the needs of new residents and to integrate with the broader network. As an absolute *minimum*, developers shall be required to retain at least five percent of the developable area as open space or parkland suitable for active recreation use.**
- **Evaluate local planning and zoning requirements that have a major impact on open space and greenway corridors.**
  - **Examine the desirability and legal feasibility of adopting an open space zoning category.**
  - **Evaluate the definitions and requirements for green/open space in each zone.**
  - **Develop design standards to guide the development of parks, trails, and open space; including a consistent method for signage and a hierarchy of pathway sections for different pathway functions and environmental conditions.**
  - **Consider a cash-in-lieu of land ordinance that requires developers to pay into a City Parks and Recreation fund if they**

cannot provide adequate green space, parklands and recreation facilities on-site as part of their development. The City fund will be used for parkland acquisition and the construction of new recreation facilities.

- Develop a plan to prioritize, identify funding sources, and implement strategies for establishing additional parks, open space, and greenways.
  - Continue to develop a GIS-based inventory of public lands, easements, privately owned green space, and trails.
  - Determine gaps in the open space and greenway network and identify parcels appropriate for land acquisition, easements, land swaps, and cooperative agreements.
  - Pursue redevelopment strategies that will increase the availability of open space and parkland.
  - Redesign infrastructure to increase public green space in existing neighborhoods.
- Create safe pedestrian and bicycle routes between residential areas, parks, open space areas, commercial areas, and transportation centers (such as the Shady Grove Metro Station, Olde Towne/ Metropolitan Grove MARC Stations, and stops along the future Shady Grove-Clarksburg Transitway).
- Prepare and implement plans to maintain and enhance existing open space and greenways. These plans should include strategies to renovate and enhance existing recreation facilities and trails, restore stream banks and stream valleys buffers, and enhance the ecological and aesthetic value of ponds, streams, and other open spaces.
- Promote community awareness regarding the importance and availability of open space and greenways.
  - Produce a single user-friendly map of public parks and greenways in Gaithersburg.
  - Develop a greenway education program that includes a series of informative and interpretive signs that provide directional information, wildlife and plant life information, and trail identification.
- Continue to research and obtain state and federal funding to finance open space acquisition and development, trail enhancement and maintenance, and habitat restoration.

### 3.4 Forests and Landscapes



**Figure 10** Gaithersburg's landscape and forestry management programs have earned numerous awards.

The **urban forest** is comprised of trees and woodlands on undeveloped lands, public lands, private property, and along streets. **Landscaping** includes the trees, shrubs, and herbaceous species on parks, private, and commercial lands that provide aesthetic value and habitat for wildlife. Not only is the size and availability of these areas important, the **species composition** within these areas is significant. Some species are better suited for a particular environment and provide greater ecological and aesthetic value.

**Native plants**, for example, are better adapted to local physical, climatic, and ecological conditions. This results in lower use of fertilizers or pesticides, little supplemental watering or seasonal care, and provides wildlife and ecological value. **Invasive exotic plants** are species intentionally or accidentally introduced, by human activities, into a region where they did not originate. Since invasive exotic species have few natural controls, they frequently out-compete native plants, impact native wildlife, and change entire ecosystems.

A thriving urban forest and landscape network provides multiple ecological, economic, and aesthetic benefits:

- ? Creating a sense of place and making communities more attractive and livable with a tendency to increase property values.
- ? Providing habitat for wildlife and supporting ecosystems that otherwise would not exist in an urban area.
- ? Providing a connection with nature, in an urban setting, that creates recreation and education opportunities.
- ? Filtering the air by absorbing green house gases and trapping airborne particulates and other pollutants.
- ? Improving stream water quality and quantity management, by reducing stormwater runoff, filtering sediment and pollutants, providing stream bank protection, and preventing soil erosion.



- ? Supplying shade and other climate control measures to reduce the heat island effect,<sup>10</sup> which consecutively affects the ambient temperatures and thermal impacts of stormwater runoff, energy use, concentrations of ground level ozone, and human health.
- ? Reducing heating and cooling energy costs for buildings.
- ? Abating noise pollution by absorbing and blocking urban noise.

### Baseline Conditions

According to Maryland National Capital Park and Planning Commission's (M-NCCPC) 1999 tree cover analysis, Gaithersburg contains approximately 1,657 acres of urban forest. Map 7 displays Gaithersburg's forests and tree canopy coverage. Overall, forest resources within the City tend to be fragmented by developments, utilities, sewer lines, and road crossings. Despite this fragmentation, there are still a few remaining tracts of mature woodlands within the City. According to the map, it is apparent that the majority of forest



**Figure 11** Tree canopy covers approximately 26% of the City.

resources are located along stream valleys and public parks. These areas generally contain steep slopes and wet soils that have historically limited logging, agriculture, and development. The *Environmental Standards* protect these sensitive areas. Other large tracts of forest are located in the Casey-Metropolitan Grove Study Area and along the Muddy Branch. Natural resource inventories indicate that these areas are potentially large enough to support forest interior dwelling (FID) species (see Wildlife section). Additional special protection measures are needed to protect these resources during development. Significant tree canopy coverage is evident in older neighborhoods containing mature street trees.

The condition and species composition of Gaithersburg's urban forests are based on such factors as the type of land use, topography, soil, sun exposure,

---

<sup>10</sup> According the U.S. Environmental Protection Agency, heat islands form as vegetation is replaced by asphalt and concrete for roads, buildings, and other structures necessary to accommodate growing populations. These surfaces absorb – rather than reflect – the sun's heat, causing surface temperatures and overall ambient temperatures to rise. The displacement of trees and shrubs eliminates the natural cooling effects of shading and evapotranspiration (a natural cooling process in which water transpires from a leaf's surface and evaporates into the atmosphere, reducing ambient temperature).

invasive plants present, and maintenance regimes. Gaithersburg's forests are typically categorized as mature deciduous forests, young mixed deciduous and coniferous forests, or early succession forests. Typical species include white oak (*Quercus alba*), northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), sweetgum (*Liquidambar styraciflua*), green ash (*Fraxinus pennsylvanica*), eastern sycamore (*Platanus occidentalis*), black cherry (*Prunus serotina*), and the tulip tree (*Liriodendron tulipifera*). Other common native species are included in Appendix B.

Agriculture and development disturbance have fragmented forests and created woodland "edge" areas. These edge areas are more susceptible to exotic invasive vegetation that rapidly grow, invade habitats, displace other species, and modify ecosystems. Such species include garlic mustard (*Alliaria petiolata*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), mile-a-minute (*Polygonum perfoliatum*), tree of heaven (*Ailanthus altissima*), Japanese stilt grass (*Microstegium vimineum*), and pampas grass (*Cortaderia selloana* and *C. jubata*). Appendix C provides a comprehensive list of common exotic invasive species found in Maryland. There is a regional effort to promote an education and maintenance program to deter the growth of invasive species and, whenever possible, utilize native plants in landscaping for new developments.

The City's Capital Improvements Program, Forest Conservation Fund, and Landscape and Forestry Program support reforestation, street tree planting and maintenance, and the enhancement of landscaped areas. In efforts to restore habitat and forest buffers, the City uses Forest Conservation Funds or works with developers to perform reforestation projects. Map 8 provides a preliminary overview of potential reforestation receiving sites throughout the City. Priority sites include stream valley buffers, steep slopes, public parks, connections between existing forest areas, potential habitat areas, and areas of scenic value. The City's tree planting and landscape enhancement projects, performed under the guidance of the Beautification Committee, have helped the City earn the "Tree City USA" designation for over fourteen years. An important component of this program is planting and maintenance of street trees. Map 9 provides a preliminary inventory of the street trees in Gaithersburg. Street sections identified in this map that either lack street trees or have irregular planting patterns are priorities for future enhancement projects. A more comprehensive GIS-based inventory and analysis of the City's street tree network should be conducted to aid in future project planning and maintenance.

## Map 7: Tree Canopy Coverage

### Draft Environment Element Forests & Tree Canopy

1 inch equals 3,000 feet  
1,500 750 0 1,500 Feet  
500 250 Meters



#### Legend

- ▬ City Boundary
- ▬ Roads
- ▬ Streams
- ▬ Lakes
- ▬ Forest and Tree Canopy Cover (1999)

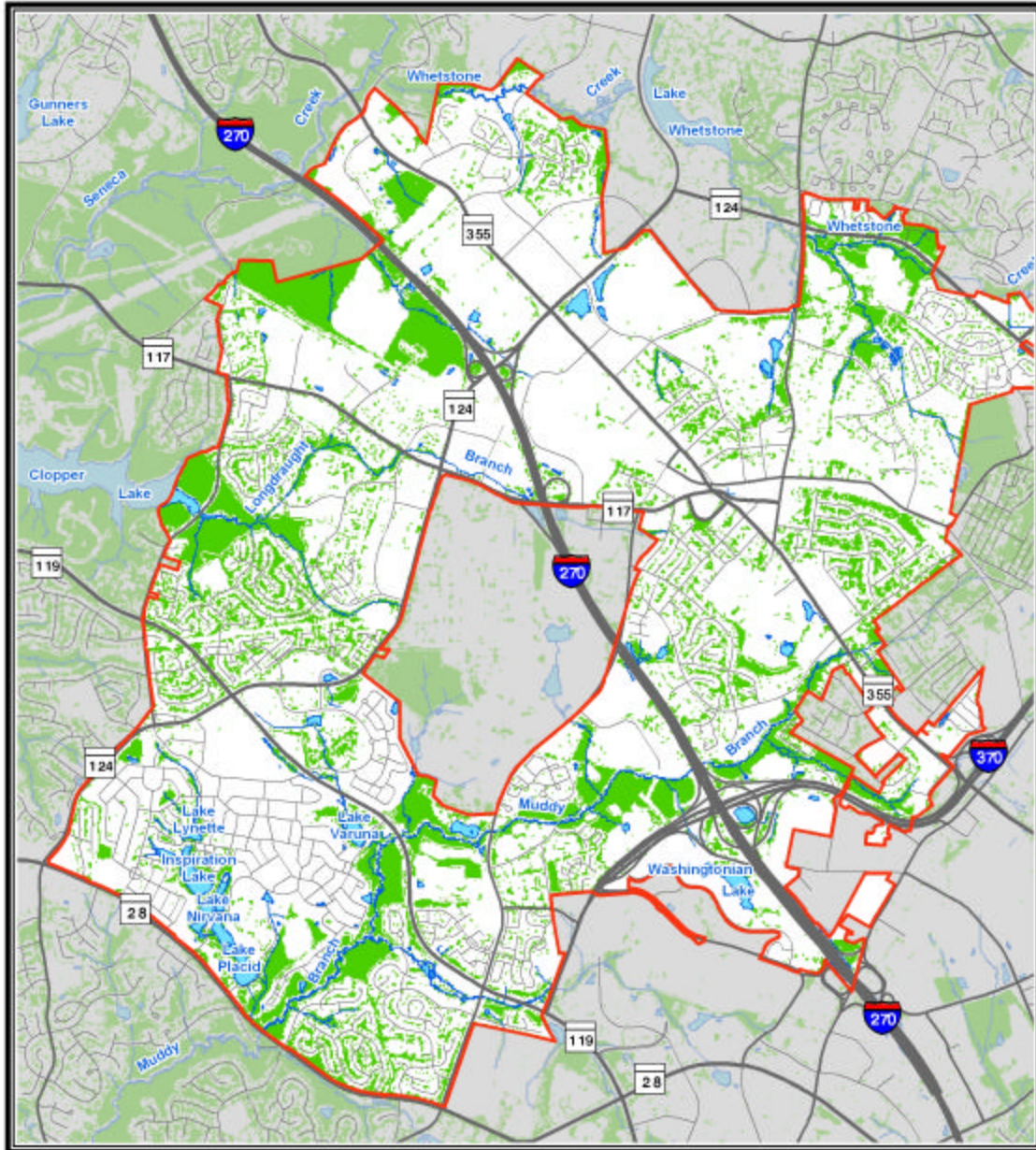
Land Cover information ©2003 Montgomery County DIST-GIS and Montgomery County Department of Environmental Protection. Planimetric base map, including roads, lakes, and streams, ©2003 M-NCPPC and City of Gaithersburg. All rights reserved.

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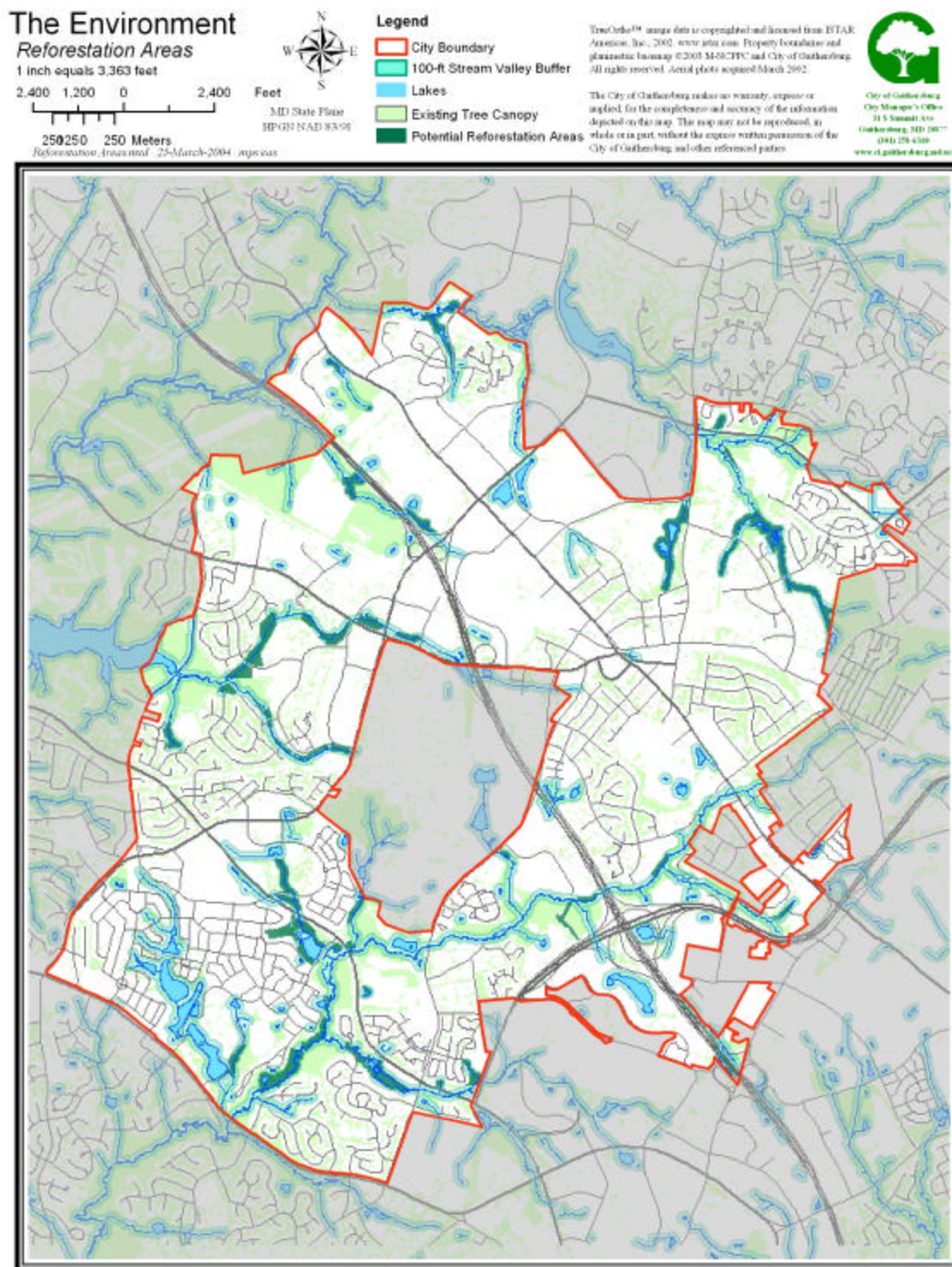
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Tree Cover.mxd 25-March-2004 jlu-azs





## Map 8: Potential Reforestation Receiving Areas





## Map 9: Preliminary Street Tree Inventory

### Draft Environment Element Street Trees

1 inch equals 2,944 feet  
3,000 1,500 0 Feet  
500 250 Meters



#### Legend

##### Street Tree Status

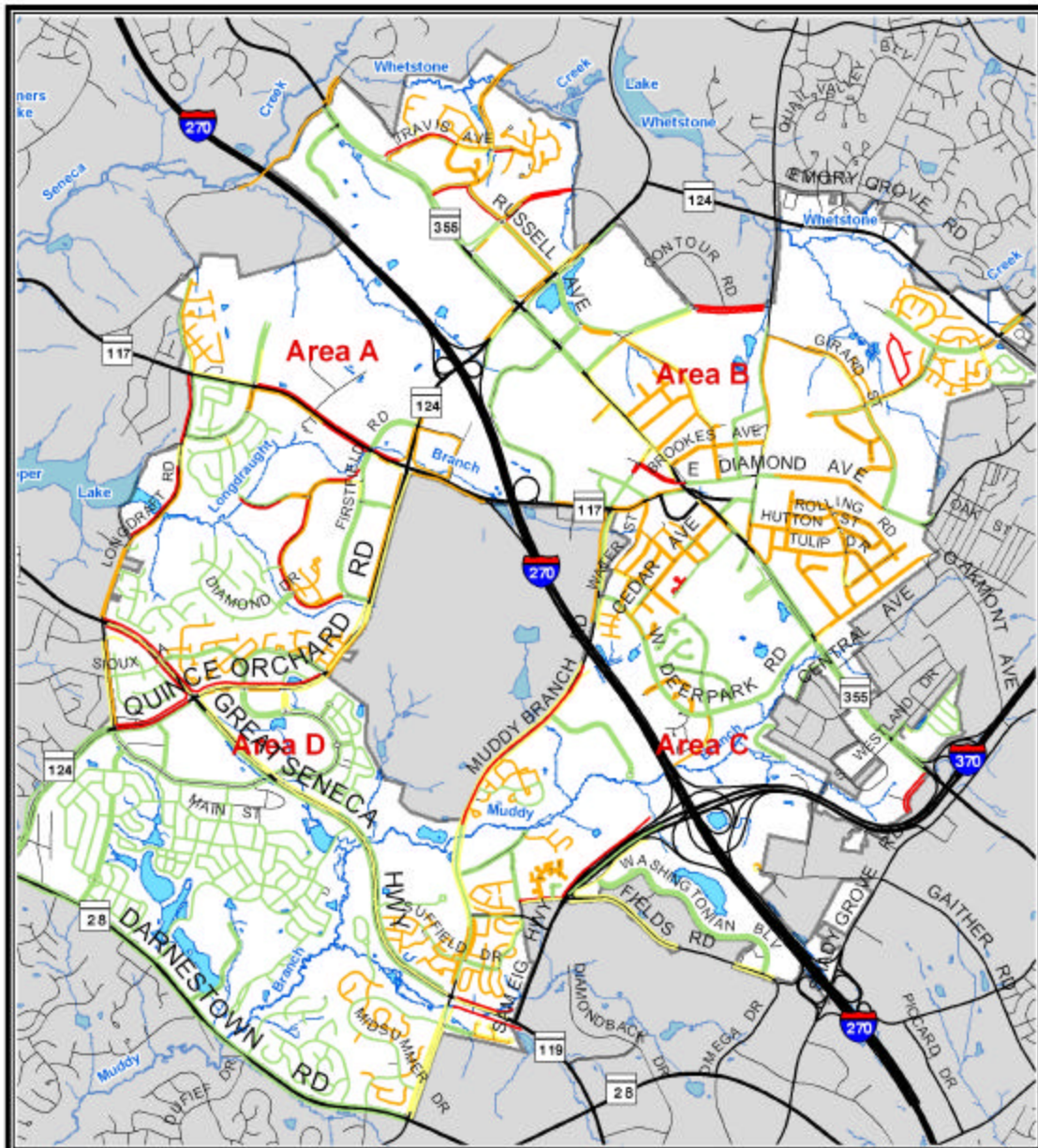
- No street trees (Priority enhancement area)
- Irregular tree planting (Potential enhancement area)
- No street trees, physical restrictions (Enhance areas where feasible)
- Regular street tree pattern (Maintain area)

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## Draft Environment Element Street Trees- Area A

1 inch equals 1,544 feet  
3,000 1,500 Feet  
500 250 Meters



- Legend**  
**Street Tree Status**
- No street trees (Priority enhancement area)
  - Irregular tree planting (Potential enhancement area)
  - No street trees, physical restrictions (Enhance areas where feasible)
  - Regular street tree pattern (Maintain area)

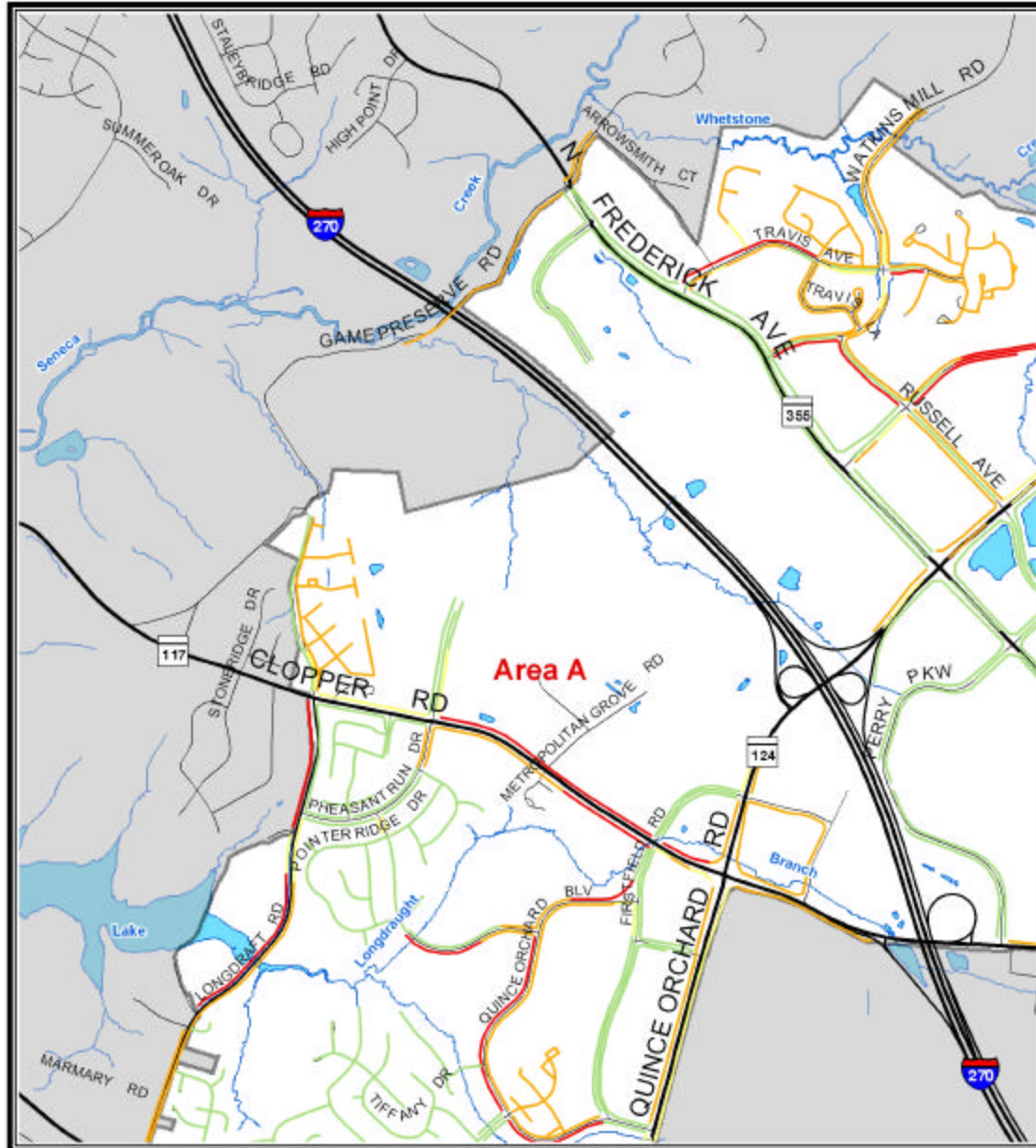
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Street Trees.mxd 21-March-2004 JRever



## Draft Environment Element Street Trees- Area B

1 inch equals 1,544 feet  
3,000 1,500 Feet  
500 250 Meters



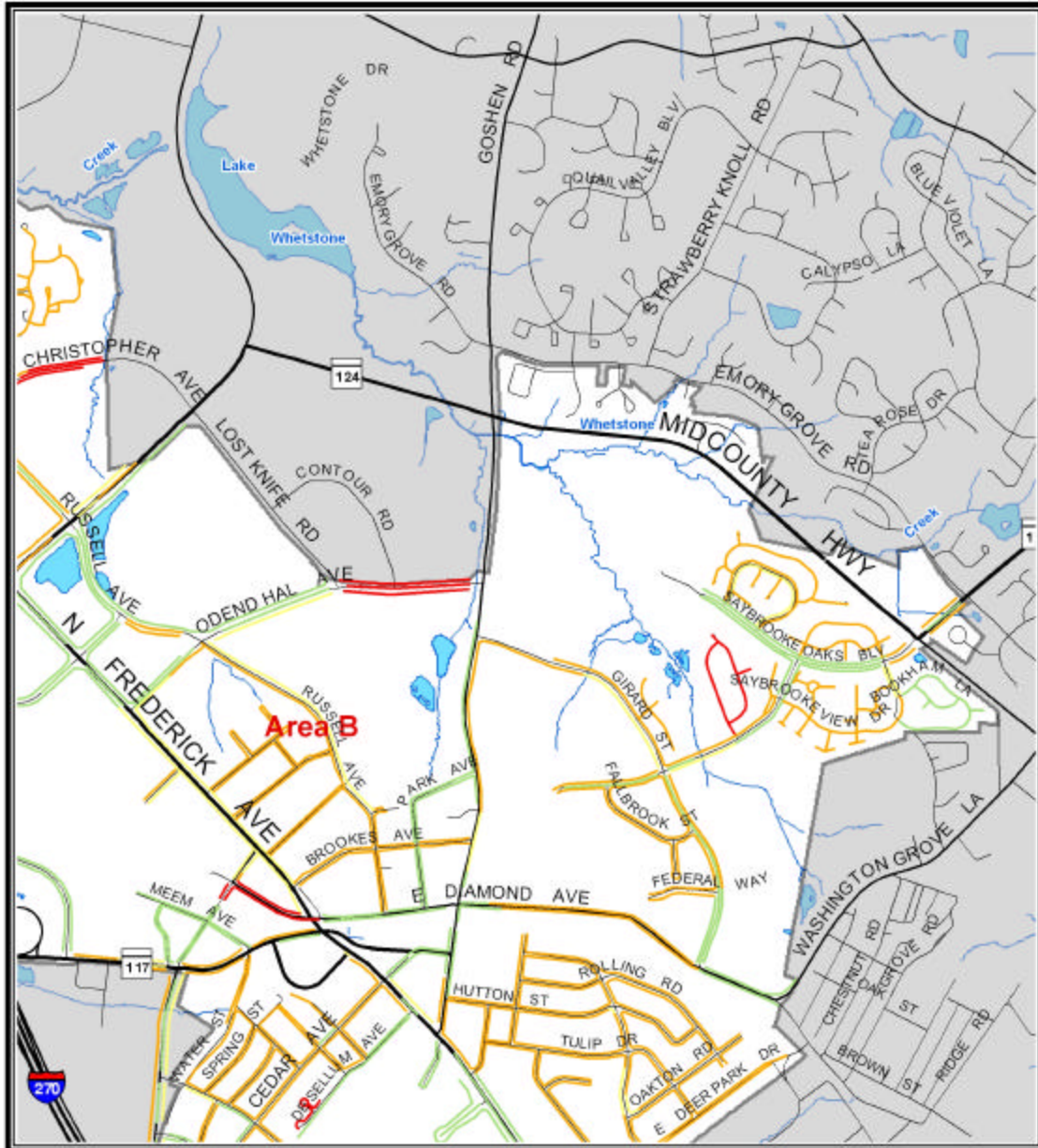
- Legend**  
**Street Tree Status**
- No street trees
  - (Priority enhancement area)
  - (Irregular tree planting)
  - (Potential enhancement area)
  - No street trees, physical restrictions (Enhance areas where feasible)
  - Regular street tree pattern
  - (Maintain area)

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## Draft Environment Element

### Street Trees- Area C

1 inch equals 1,544 feet

3,000 1,500 Feet  
500 250 Meters



#### Legend

##### Street Tree Status

- No street trees
- (Priority enhancement area)
- Irregular tree planting
- (Potential enhancement area)
- No street trees, physical restrictions
- (Enhance areas where feasible)
- Regular street tree pattern
- (Maintain area)

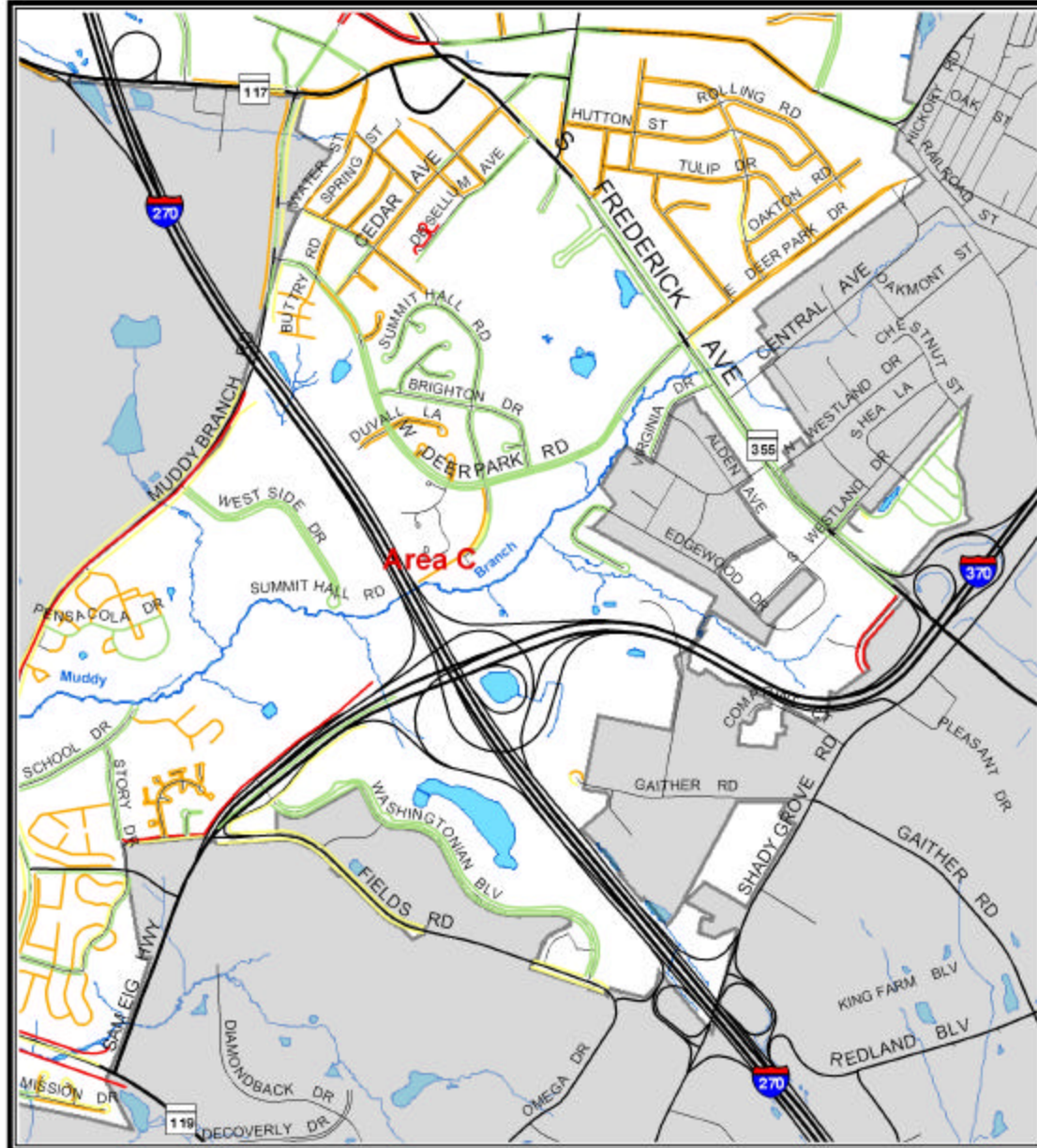
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Street Trees.mxd 21-March-2004 JRever



## Draft Environment Element Street Trees- Area D

1 inch equals 1,544 feet  
3,000 1,500 Feet  
500 250 Meters



Street Trees.mxd 21-March-2004 Review

### Legend

#### Street Tree Status

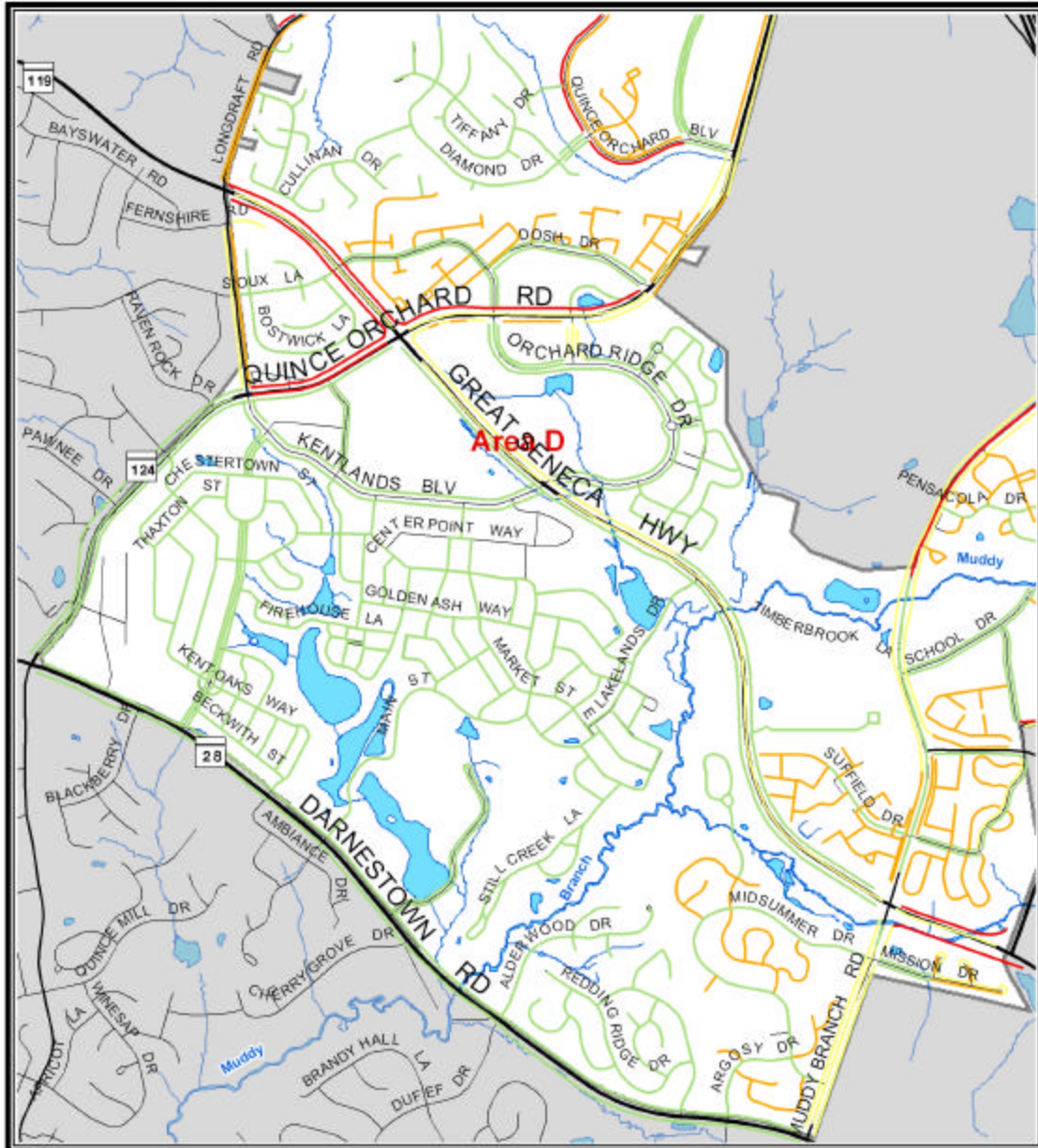
- No street trees (Priority enhancement area)
- Irregular tree planting (Potential enhancement area)
- No street trees, physical restrictions (Enhance areas where feasible)
- Regular street tree pattern (Maintain area)

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## **Forests and Landscapes Protection and Enhancement Strategies**

Gaithersburg seeks to maintain a thriving “urban forest” that provides ecological, economic, and aesthetic benefits. Management of these resources involves protecting existing forests and specimen trees, reforesting priority planting areas, improving canopy coverage in streetscapes and landscape areas, requiring landscaping around buildings and in parking lots, controlling invasive species, and promoting the planting of native species.

The City’s *Tree Manual* and Chapters 21 and 22 of the City Code govern the protection of forests and specimen trees. Forest conservation measures include minimizing tree clearing, retaining specimen trees, and requiring reforestation and tree replacement for areas that are unavoidably cleared. A major goal of the forest conservation program is to protect existing trees and to ensure that tree planting (afforestation/reforestation) occur onsite. However, when the requirements cannot be met on-site, there are provisions for conducting off-site planting and, as a last resort, paying a fee to the City’s forest conservation fund for future reforestation projects. The following are strategies to protect and enhance Gaithersburg’s forest and landscape network.

- **Continue to implement, enforce, and improve regulations and recommendations associated with the Maryland Forest Conservation Act, Chapter 21 of the City Code (Tree and Vegetation- Public Lands), Chapter 22 of the City Code (Tree and Forest Conservation), and the *Tree Manual* in order to better protect and enhance forest resources.**
- **Evaluate the definitions, requirements, and guidelines for forests and landscaping in local planning and zoning requirements. Make necessary modifications to improve forest and tree protection and to increase tree canopy coverage.**
  - **Create stronger requirements and incentives to protect specimen trees and forests located outside of stream valley buffers; especially significant upland forests and areas where forest interior dwelling species may live. Consider prohibiting developments with existing forests from clearing past the “break even point” and mandating developments without forests to meet afforestation requirements on site.**
  - **Create landscaping guidelines that require shade trees adjacent to buildings and in parking lots to reduce energy costs, shade paved areas, and reduce the “urban heat island” effect.**
  - **Require new development projects to place wooded stream buffer areas in a conservation easement and educate landowners on the importance of long-term conservation easements.**
  - **Require new development/redevelopment to preserve or create landscape buffers to provide visual separation and noise mitigation from major roads.**

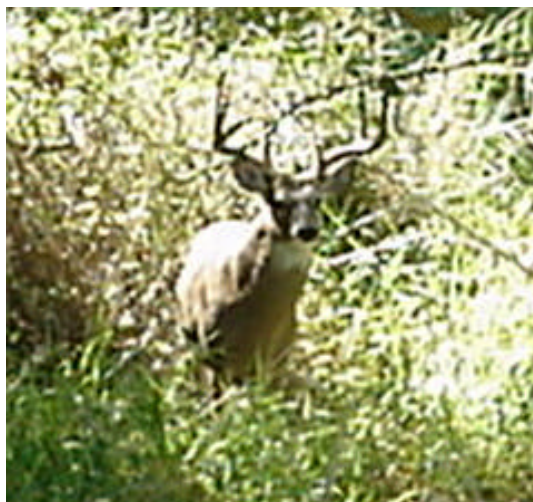


- Require a minimum percentage of native species in landscape plans, as found in Appendix B. The remaining plant materials in forest and landscape plans should not be exotic invasive, as found in Appendix C.
- Achieve “canopy closure” and biodiversity in street tree design by encouraging the use of a variety of shade trees that will prevent the risks associated with monoculture. The U.S. Department of Agriculture and the Center for Urban and Community Forestry recommend that no more than 10% of any single genus be planted in a neighborhood to protect from the effects of disease.
- Adopt Thoroughfare Design Standards which include landscape standards and planting width standards by street type.
- Require underground utilities, whenever possible, to reduce the negative effects of overhead lines on tree health and canopy coverage.
- **Create City Street Tree Enhancement and Reforestation Plans:**
  - Utilize Geographic Information System (GIS) to analyze Gaithersburg’s forest network to determine the locations of existing forests, general forest health, forests protected by conservation easements or in public ownership, priority forest protection areas, and potential reforestation areas.
  - Record a series of “standard” forest conservation easements that can be referenced on plats (similar to the Public Improvement Easement (P.I.E.) and Public Utility Easement (P.U.E) programs).
  - Create a spatially-referenced inventory of forest conservation easements and identify locations of potential new areas.
  - Utilize Geographic Information System (GIS) to develop a comprehensive inventory of street trees and specimen trees on public lands; including information on location, species diversity, condition, and maintenance needs. This inventory will also locate prominent specimen trees in need of protection and guide streetscape planning and maintenance. Until a more thorough assessment of street trees can be conducted, Map 9 provides a general overview of the presence of street trees throughout the City and provides preliminary guidance for future street tree enhancement projects. This map identifies areas containing uniform plantings, containing irregular or partial plantings (due to storm damage, die-off caused by age, or physical barriers such as overhead utility lines, narrow planting beds, paved medians, etc,) and lacking plantings along the curb or in the median.
  - Coordinate with a landscape architect and the City Beautification Committee to develop a Street Tree Master Plan for all City streets to guide tree planting.

- **Develop a comprehensive map that prioritizes reforestation and forest enhancement areas to improve the quantity and health of the urban forest network. This should include infill planting, trash removal, invasive species removal, and general maintenance needs. This map will prioritize reforestation projects funded by the Forest Conservation Fund or performed by developers to meet offsite planting requirements. Map 8 provides a preliminary overview of potential reforestation receiving sites throughout the City.**
- **Establish planting guidelines that encourage the use of native plants, providing aesthetic pleasure, wildlife habitat, and watershed protection benefits.**
- **Continue to research and obtain outside funding to support reforestation projects on public and private lands (i.e., Department of Natural Resources' Buffer Incentive Program, Urban and Community Forestry Funds, Chesapeake Bay Trust, etc.).**
- **Continue to educate the community about urban forestry; including proper maintenance of trees, plant selection, planting location, the importance/requirements of forest conservation easements, and management of native and exotic invasive species.**
- **Continue support volunteer-based tree planting, invasive species removal, stream/park clean-up projects.**
- **Adequately fund the City's Capital Improvements Program to plant and maintain public trees.**
- **Seek grant funding to support community education and reforestation projects.**

### 3.5 Wildlife

Urban wildlife is any wild creature that lives in an urban environment or an urban-rural interface; including birds, reptiles, amphibians, mammals, fish, insects, and worms. Preserving wildlife habitat is important because of aesthetic, ecologic, educational, historic, recreation, scientific, and economic values associated with wildlife. For instance, recreational activities such as bird watching, hunting, and fishing are all dependent upon wildlife. Subsequently, these activities support the economic values associated with wildlife.



**Figure 12** In recent years, Gaithersburg residents have seen more white-tailed deer (*Odocoileus virginianus*) than ever before.

Unfortunately, numerous wildlife and plant species, in the United States, have been rendered extinct or threatened as a consequence of development pressures and agricultural operations. These human actions have significantly reduced or fragmented habitat and migration corridors. For this reason, the federal Endangered Species Act (ESA) was created to protect endangered and threatened species, as well as their habitat. The purpose of the ESA is to “conserve the ecosystems upon which endangered and threatened species depend and to conserve and recover listed species.” The Maryland Department of Natural Resources (DNR) maintains a list of species listed as rare, threatened or endangered, species in need of conservation, or a watchlist species<sup>11</sup>. In addition to ESA species, forest interior dwelling (FID) species<sup>12</sup>, particularly birds, require large tracts of unfragmented woodland to supply their life requisites. These species are extremely vulnerable to the fragmentation of woodland areas. Consequently, special protection measures are needed to ensure the quantity and quality of their habitat.

The key to protecting wildlife is protecting habitat. Wildlife habitat preservation is traditionally accomplished by federal regulation; enacted once a species has been listed as “threatened” or “endangered”. Unfortunately, this after-the-fact protection method does not provide adequate prevention measures. A better approach is to incorporate wildlife habitat preservation into the local or regional

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<sup>11</sup> “Watchlist Species” are species that are uncommon and/or experiencing severe declines in population size or range in Maryland but are not actively tracked by the Heritage and Biodiversity Conservation Program. Total statewide populations of watchlist species are generally within the 21-100 range.

<sup>12</sup> Appropriate FID habitat may require forest areas of at least 10 acres in size or riparian (streamside) forests that are at least 300 feet wide.

planning process. Proper wildlife protection planning should ensure adequate space and habitat for basic life requirements:

- ? Safe, undisturbed areas for breeding, both on land and in the water;
- ? Shelter, which can be underground, in the soil, on the land surface, in water, or in trees and shrubs;
- ? Food supply, which may require suitable habitat for the plants and animals that provide the food supply;
- ? Migratory routes; and
- ? Overwintering areas for those species that require seasonal migration for shelter or breeding.

### **Baseline Conditions**

The Maryland Natural Heritage Program (NHP), administered by DNR, is the lead state agency responsible for the identification, ranking, protection, and management of nongame, rare, threatened, and endangered species (RTE) and their habitats in Maryland. Data collected by NHP ecologists, contractors, and cooperators provide the scientific foundation for the RTE species lists. According to NHP, there is evidence that the following ESA plant and animal species are found in Gaithersburg:

1. *Calystegia spithamea*, Low Bindweed - rare (1951)
2. *Cistothorus platensis*, Sedge Wren - threatened (1978)
3. *Lygodium palmatum*, Climbing Fern - threatened (1907)
4. *Scutellaria leonardii*, Leonard's Skullcap - threatened (1939)

Appendix D provides additional information regarding the potential RTE species. Natural resource inventories have also identified forested areas, such as the Casey-Metropolitan Grove Study Area, the Casey-Goshen tract, and along the Muddy Branch, with the potential to support watchlist species and FID bird species. The City should continue to identify the locations and habitats of such species and establish appropriate protection measures.

Other common urban wildlife include white-tailed deer, beaver, Canadian goose, raccoon, red fox, Virginia opossum, skunk, eastern cottontail rabbit, eastern gray squirrel, brown bat, and assorted bird species. These types of wildlife can add to the enjoyment of everyday life and provide many benefits in an urban setting. Nevertheless, certain species of wildlife create management challenges. Widespread modifications to habitat, coupled with a lack of natural predators to control populations, have created problems with white tailed deer, Canadian geese,



and beaver. For example, increased white-tailed deer populations have resulted in increased deer-auto collisions and damage to crops and landscaping. Beaver activity has increased in our stream valleys leading to tree damage and altered stream channels. There is also an increase in the number of Canadian geese that have taken up residence in this area; thus creating problems with territorial behavior, abundance of goose droppings, and decline in water quality.



**Figure 13** The conditions in Maryland are favorable for Canadian geese (*Branta canadensis*), there is an abundant food supply and no natural predators; consequently, their populations have increased significantly.

### **Wildlife Protection and Management Strategies**

The challenge of wildlife protection and management is working within the community to enhance those parts of the urban environment that contribute to the survival and diversity of desirable wildlife while minimizing the effects of nuisance species. Standard wildlife habitat protection measures include land acquisition, establishing conservation easements, and forest restoration. Community-wide education programs are also encouraged to foster wildlife appreciation and tolerance. The following strategies are aimed at preserving and enhancing wildlife habitat and ensuring compatible human-wildlife interactions.

- **Utilize wildlife surveys, from organizations such as the Maryland Department of Natural Resources Heritage and Biodiversity Conservation Program, to identify and protect existing habitat locations for rare, threatened, and endangered species in need of conservation (RTE), forest interior dwelling (FID) species, and State watchlist species.**
- **During the development review process identify, protect, and enhance wildlife habitat areas.**
  - **Provide special habitat protection measures for areas supporting RTE, watchlist, or FID species. Depending upon the species, the minimum area required to provide suitable habitat varies. For example, the *Chesapeake Bay Critical Area Criteria* identifies potential FIDS habitat as, existing forests buffering streams and wetlands with a minimum of 300 feet in width on each side of a stream.**
  - **During plan review, maintain corridors for safe wildlife movement, prevent fragmentation of large undeveloped tracts of wooded and open parkland, and maintain structural and plant-species diversity within vegetated areas.**

- Prevent the construction of fish migration barriers (e.g., man-made structures such as dams, culverts, or weirs) during development and remove existing fish barriers where feasible.
  - Direct reforestation to stream valley buffers, floodplains, connections between and additions to forested areas, critical habitats, steep slopes, and land use buffers.
- Where development is expected to impact wildlife or habitat on a site, require site development packages to include a Wildlife Management Plan, as outlined in the *Environmental Standards for Development Regulation*.
- Collaborate with regional efforts to study and develop strategies to minimize human-wildlife conflicts.
- Develop habitat enhancement strategies to encourage desirable urban wildlife habitats on public and private land. Such strategies, like BayScapes, involve conservation landscaping, water conservation, wildlife habitat creation, and the use of Integrated Pest Management. Along with reducing pollution and protecting the quality of our streams, BayScapes provide diverse habitats for songbirds, small mammals, butterflies, and other creatures.

### 3.6 Air Quality

Air pollution affects human health, soil and water quality (via deposition), forest and tree health, visibility, property, and agricultural productivity. Major criteria air pollutants in this region include ground level-ozone, carbon monoxide, nitrogen dioxide, particulates, and sulfur dioxide. There are also toxic air pollutants, also known as hazardous air pollutants, which are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects.

The U.S. Environmental Protection Agency has listed approximately 188 hazardous air pollutants, examples include: benzene, which is found in gasoline; perchlorethylene, which is emitted from some dry cleaning facilities; methylene chloride, which is used as a solvent and paint stripper by a number of industries; and metals such as cadmium, mercury, chromium, and lead compounds. The

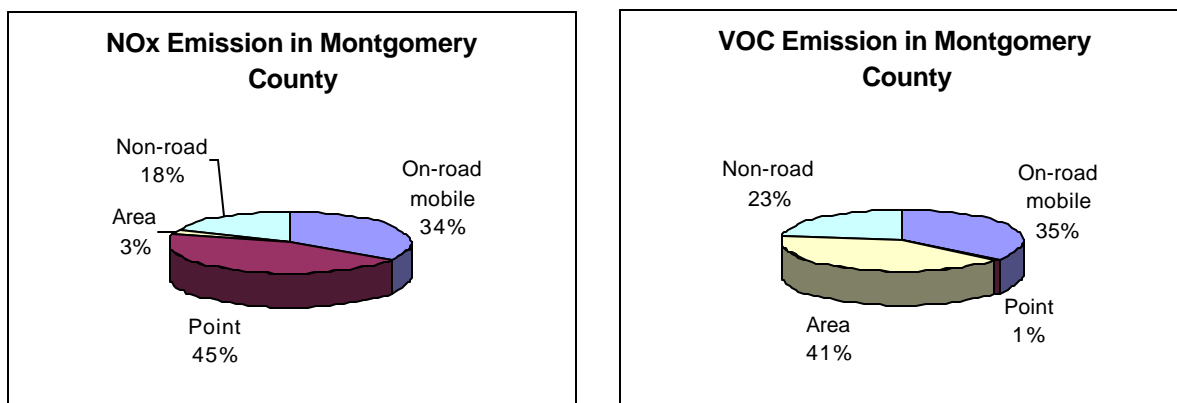


**Figure 14** On-road mobile sources, such as the traffic on Interstate 270, account for 34% of NO<sub>x</sub> emissions and 35% of VOC emission in Montgomery County.

management of air quality is considered an important regional challenge since atmospheric pollutants travel long distances and cross geographical boundaries.

### Baseline Conditions

The entire Washington Metropolitan Area, including Gaithersburg, falls into the “severe” non-attainment classification for EPA’s one-hour ozone standard. This means that, on average, ground level ozone in the region’s airshed greatly exceeds the federal standard for what constitutes healthful air. The ground-level ozone precursors, NOx and VOCs, are of primary concern in Montgomery County. Figure 1 presents the sources responsible for contributing to NOx and VOC emission in Montgomery County, according to 1999 Periodic Emissions Inventory (PEI) compiled by the Metropolitan Council of Governments. Point sources are stationary sources that emit more than 10 tons per day of emissions. Area source emissions include small industries, such as bakeries, dry cleaners, paint works, printing facilities, and auto repair facilities. Non-road sources include construction and farming equipment, commercial and residential lawn and garden activities, and recreation boating. On-road or mobile sources are emissions from transportation sources and are estimated from regional transportation models. As depicted in the pie chart, the main sources of NOx emissions are point source (45%), on-road mobile (34%), non-road (18%), and area (3%). While the main sources of VOC emission are area (41%), on-road mobile (35%), non-road (23%), and point source (1%).



**Figure 15 NOx and VOC emission in Montgomery County. Source: Montgomery County Department of Environmental Protection, 2003.**

Similarly, it is expected that Montgomery County will be designated as a “nonattainment” area for the stricter 8 hour ozone standard and the new fine particulate matter (PM 2.5) standard. Montgomery County also has the highest levels of air toxins in Maryland. EPA’s toxic database shows that Montgomery County and the surrounding areas have extreme levels, above the 95th percentile, of some notable air toxins such as perchloroethylene (from dry cleaners), diesel particulate matter, and mercury (from power plants).

## **Air Quality Improvement Strategies**

Although Gaithersburg does not conduct its own independent air pollutant monitoring and does not directly manage regional air quality, local policies can ensure that Gaithersburg is contributing its fair share to improve air quality. Gaithersburg can develop a “Clean Air Counts” initiative, modeled on programs from other localities, that incorporates many of the following strategies:

- **Participate in regional efforts to reduce air pollutants in the Washington, D.C. metropolitan area, such as Montgomery County’s Air Quality Protection Strategy.**
- **Educate the community about ways to reduce emissions from public activities (e.g., avoiding outboard motors, car pooling, properly maintained automobiles, alternative transportation options, etc.).**
- **Coordinate with Montgomery County’s “Environmental Partners Program” to reduce emissions from area sources, such as service stations, paint manufacturers, dry cleaners, and bakeries.**
- **Promote green building design methods and technologies that support energy efficiency in municipal, residential, and commercial buildings.**
- **Evaluate local government facilities and operations such as municipal buildings, street lighting, recreation facilities, and fleet management for ways to promote energy efficiency and reduce emissions.**
- **Reduce emissions from City fleet and operations by replacing passenger cars with hybrid-electric vehicles or other clean-technology vehicles.**
- **Reduce dependency on automobile travel by providing increased transit opportunities by encouraging development and redevelopment to provide bike lockers/ racks and dressing areas; and by creating sidewalks and biking trails that connect to centers for employment, shopping, and residential areas.**
- **Purchase power from zero emission sources through the County’s joint procurement effort. The goal of this program is to purchase 5 percent of the power from zero emission sources, such as wind energy, that are located within sufficient geographic proximity to provide a local air quality benefit.**
- **Protect and increase tree canopy forest cover in order to remove air pollutants and reduce energy use for heating and cooling. For example, American Forests has developed tree canopy coverage goals for urban and suburban areas. These guidelines recommend: 1) 50% tree canopy coverage in suburban residential areas; 2) 25% tree canopy coverage in**



urban residential areas; 3) 15% tree canopy coverage in central business districts; and 4) 40% tree canopy coverage overall.

- **Work with Maryland and Montgomery County to publicize such programs as the Small Business Pollution Compliance Loan Fund, Tax Credits for Employer-Provided Computer Benefits Program, Ozone Action Days, and Commuter Services.**

## 4. URBAN ENVIRONMENT

Sustaining and enhancing the quality of life and environmental health in our community is a central goal of Gaithersburg's comprehensive plan. As stated in the Maryland Planning Act, a community master plan must include measures that foster resources conservation; including the reduction of resource consumption. Therefore, Gaithersburg must not only focus on protecting natural resources; but also where we build, how we build, and how we consume resources. Sustainable practices and policies are those that synergistically support environmental health and quality, economic well being, and community equity and vitality. Sustaining the quality of the urban environment involves smart growth, green building, sustainable redevelopment and historic preservation, air quality, noise pollution, light pollution, and solid waste and recycling. Through proper planning, Gaithersburg can conserve resources as well as enhance the community's quality of life.

### 4.1 Smart Growth

Maryland's 1997 General Assembly passed five pieces of legislation and budget initiatives—Priority Funding Areas, Brownfields, Live Near Your Work, Job Creation Tax Credits, and Rural Legacy—known collectively as "Smart Growth." Smart growth combines environmentally-sensitive land development with the goals of minimizing dependence on auto transportation, reducing air pollution, and making infrastructure investments more efficient. One of the key principles of Smart Growth is preserving open space, farmland, natural beauty, and critical and environmental areas.



**Figure 16** Washingtonian Center is an award winning smart growth development that incorporates a mix of uses, a pedestrian friendly streetscape, structured parking, and attractive community spaces.

### Baseline Conditions

The City of Gaithersburg, in July of 1999, adopted the Smart Growth Policy to provide overall guidance to the City's Master Plan as it relates to land use, transportation, infrastructure and funding priorities. Adopted as an element of Gaithersburg's Master Plan, the Smart Growth Policy is designed to act as an umbrella policy over all elements of the Plan, and serves to coalesce several existing City programs into a unified policy statement. It provides further guidance as to the quality of development that the City both encourages and anticipates for its future. Under the definitions of the State's Neighborhood Conservation and Smart

Growth legislation, the entire City of Gaithersburg is considered to be an "area appropriate for development."

### ***Smart Growth Strategies***

The City has demonstrated its commitment to Smart Growth by developing its own criteria that parallel the State's goals while also addressing the particular needs of Gaithersburg. Further discussion of State Smart Growth priorities and programs as well as Gaithersburg's goals and strategies is located in the Smart Growth section of the Master Plan (located elsewhere in the Master Plan).

## **4.2 Green Building**

Buildings significantly impact our natural environment, economy, health, and productivity. Nationally, buildings account for 36 percent of all primary energy use, 65 percent of electricity use, 30 percent of raw materials consumed, and 12 percent of potable water consumed. In addition, building construction and demolition wastes generate 30 percent of all non-industrial waste. Due to the extent that buildings affect the environment, the principle of "green building" has gathered momentum throughout the country. Gaithersburg recognizes that changing the way that buildings are designed, constructed, and operated can have a profound impact on the environment and human health, and therefore encourages "sustainable," or "green" building practices to be applied in both public and private development.



**Figure 17** The Chesapeake Bay Foundation's Philip Merrill Environmental Center, in Annapolis, Maryland, was the first building to receive a LEED Platinum Rating from the U.S. Green Building Council.

Green building is a collection of land use, building design, construction, and operation and maintenance strategies that maximizes environmental and economic performance. For example, green building principles and practices include minimizing site disturbance, conserving and reusing water, treating stormwater on-site, maximizing the use of local materials, purchasing recycled materials, optimizing energy performance by installing energy efficient equipment and systems, optimizing climatic control through site orientation and design, integrating natural day-lighting and ventilation, improving indoor air quality to enhance occupant health and comfort, and using renewable energy. At its best, green building regards a building as a

system, and choices made in construction or renovation consider the overall function of the system.

There is a growing body of research conclusively demonstrating that green building yields environmental, human health, and financial benefits. Studies show that students in “green schools” progress more quickly, workers in healthy buildings are more productive, and shoppers buy more in a naturally-lit store. Notable recent research confirms the tremendous cost benefits associated with efficient integrated design. In 2003, *The Costs and Financial Benefits of Green Building*, a report developed for the Sustainable Building Task Force, a group of over 40 Californian state government agencies, concluded that:

*[A] minimal upfront investment of about two percent of construction costs typically yields life cycle savings of over ten times the initial investment. For example, an initial upfront investment of up to \$100,000 to incorporate green building features into a \$5 million project would result in a savings of at least \$1 million over the life of the building, assumed conservatively to be 20 years.*

The financial benefits include lower resource consumption during construction and throughout the life of the structure which consequently reduces costs for energy, waste disposal, water, emission costs, and materials; lowers operation and maintenance costs; and provides savings from enhanced occupant health and productivity. These findings clearly support sustainable design and reinforce that fact that building green makes financial and environmental sense for both the public and private sector.

### ***Baseline Conditions***

Under the guidance of the Environmental Affairs Committee, the City of Gaithersburg is working to expand its programs for smart growth and environmental protection to include the promotion of green building. As one of the first steps in this process, Gaithersburg has become one of the first cities of its size to be accepted into the U.S. Green Building Council (USGBC). The USGBC is a national coalition of leaders from across the building industry that are working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. The USGBC has developed the Leadership in Energy & Environmental Design (LEED™) Green Building Rating System, as a nationally accepted standard for green buildings. LEED™ is a self-assessing system that allots points within seven specific categories; including site location, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.

Gaithersburg has focused on educating staff and the community about green building. The City developed web pages for the community and organized green building training sessions and tours. The City also incorporated sustainability requirements in new building projects and is using architects and engineers with



green experience. Due to these changes in bid and contracting requirements, the City anticipates that the new Youth Center will receive LEED™ certification and become the City's first green building.

The City is also working to adopt policies and programs to encourage the development of green buildings without forcing excessive costs or other burdens upon developers, building owners or occupants. In October of 2003, Gaithersburg's citizen-based Environmental Affairs Committee collaborated with the Mayor and City Council to adopt a Green Building Incentive Program to provide financial incentives to developers who make their projects more environmentally friendly. In order to promote green building awareness and assess a building's environmental performance, the City requires new commercial, institutional, or multi-family development to complete and submit a LEED™ checklist as part of the site plan and building permit application process. As found in Appendix E, this checklist allows the developer to assess the options for including green components in a project. The LEED™ points system corresponds to four different levels of certification that measure a project's overall environmental performance. The points generated by the LEED™ checklist are used to determine the reduction in building permit fees; essentially the more environmentally friendly the project, the bigger the discount the developer will receive.

This program seeks to cultivate green building awareness in the local community and encourage developers to adopt design and construction techniques that reduce the environmental impact of buildings. Gaithersburg hopes that this program will benefit the building's owners, occupants, and the community by reducing operation and maintenance costs, creating healthier and safer indoor environments, and reducing the demand for natural resources, energy, water and sewer services, landfills, storm sewers, and transportation infrastructure.

### **Green Buildings Strategies**

Gaithersburg's Green Building Program seeks to: 1) educate staff, the local development community, and citizens about the principles and benefits of green building; 2) promote green building in municipal projects; and 3) encourage builders and developers to incorporate "green components" in private construction projects. The following strategies are designed to accomplish these goals.

- **Train City staff, who review site plan and building applications, to review plans against LEED criteria and suggest alternatives and improvements.**
- **Train facilities personnel in green maintenance principles.**
- **Provide education and technical support to residents, business owners, developers, and contractors on a variety of green building topics (e.g., green building materials, innovative stormwater management practices, green specifications, improving energy efficiency, construction recycling, green renovation, etc.).**

- **Continue to promote the Green Building Incentive Program which requires commercial, institutional and high-rise residential buildings to complete and submit a LEED™ scorecard and offers a tiered building permit fee reduction incentive, per the LEED™ rating system, to developers who design and construct green buildings.**
- **Require that all municipal facilities, City funded projects, and infrastructure projects be constructed, renovated, operated, maintained, and deconstructed using green building, low impact development, waste management, and conservation landscaping principles and practices to the fullest extent possible.**
- **Continue to incorporate sustainable requirements in bid requests for new municipal building projects or renovations and utilize construction consultants with green experience.**
- **Continue to perform energy audits of existing City facilities and implement energy retrofits when appropriate.**
- **Develop green maintenance procedures (e.g., structural integrity, indoor air quality, mechanical and electrical system performance, basic cleanliness, pest control, and indoor/outdoor traffic patterns) for City facilities in order to determine best maintenance and retrofit options.**
- **Continue to investigate federal and state funding sources to promote training, technical support, and capital improvement projects. Likely funding sources include Maryland Energy Administration (MEA), U.S. Department of Energy (DOE), the Urban Consortium Energy Task Force (UCTF), U.S. Environmental Protection Agency (EPA), Maryland Community Energy Loan Program, Maryland Department of Natural Resources (DNR), Public Technology, Inc. (PTI), and the US Green Building Council.**
- **Investigate incentives and disincentives to minimize solid waste from new construction, renovation, remodeling, and demolition projects and develop tools and strategies (e.g., Solid Waste Management and Recycling Plans) to minimize such waste.**

### 4.3 Sustainable Redevelopment and Historic Preservation

While redevelopment and infill are desirable to improve economic performance, they should also strive to “re-naturalize” the built environment. This means protecting or re-engineering nature’s ability to filter, store, infiltrate, evaporate, and cycle resources. When combined with effective local and watershed planning, these measures will not only help to protect or restore the local watershed, but they can also reduce overall development costs, make communities healthier and more attractive, conserve resources, and promote groundwater recharge. Gaithersburg promotes sustainable site design in redevelopment and infill projects in order to reduce pollutants and improve the environmental quality of the development site in an urbanized watershed.



**Figure 18** The redevelopment of Olde Towne Gaithersburg improves economic performance, concentrates a mix of uses around public transit, and preserves open space for community recreation.

Historic preservation is another important factor to consider during redevelopment because our historic buildings, neighborhoods, and landscapes are important to our community’s legacy. Historic resources may include buildings representative of a period or style; architecturally important buildings; sites of important events or activities; sites associated with important personages; sites with the potential for adaptive reuse; buildings, landscapes, or sites of historic or cultural value; and archeological sites. The *Historic Preservation Element* of the Master Plan provides an inventory of the City’s historic and cultural resources and outlines protection, preservation, and reuse strategies. These resources should be identified in the site plan’s Natural Resource Inventory (NRI) and protected during the development review process.

#### **Sustainable Redevelopment Strategies**

The following site development practices are techniques to protect and enhance natural resources, water quality, and habitat in the highly constrained setting of urban infill and redevelopment.

- **Require new development to comply with light pollution reduction guidelines, when feasible.**
- **Encourage adaptive reuse of buildings or reuse or recycling of building materials. This includes developing tools and strategies to reduce waste from renovation and remodeling projects.**

- **Strongly encourage shared parking/access options for redevelopment; especially sites in Olde Towne and along the Frederick Avenue Corridor.**
- **Require redevelopment to offer storage and collection facilities for recyclables.**
- **Require developers to complete stream restoration and stormwater management retrofit projects that are critical to improving the condition of streams and watersheds; especially in areas identified at critical in stream assessments and watershed studies.**
- **Require redevelopment to include Natural Resource Inventories to identify existing natural resources and develop protection and restoration strategies where feasible.**
- **Encourage innovative design techniques to preserve vegetation, minimize impervious surfaces, maximize sheet flow and groundwater infiltration, and decrease the heat island effect on stream temperatures. Where possible, the amount of impervious cover should be reduced or kept the same. In situations where impervious cover does increase, sites should be designed to improve the quality of stormwater runoff at the site or in the local watershed.**
- **Plan and design sites to preserve existing specimen trees, landscape buffers, and natural vegetated areas and enhance landscaping in sites lacking vegetation.**
- **Establish mechanisms to guarantee long term management and maintenance of all vegetated areas.**
- **Manage rooftop runoff through storage, reuse, and/or redirection to permeable surfaces for stormwater management and other environmental benefits.**
- **Parking lots, especially surface lots, should be minimized and designed to reduce, store, and treat stormwater runoff.**
- **Design the streetscape to minimize, capture, and reuse stormwater runoff. Where possible, provide planting spaces to promote the growth of healthy street trees while capturing and treating stormwater runoff.**
- **Create courtyards, plazas, and amenity open spaces to provide quality community space, habitat, and stormwater management.**
- **Design sites to maximize transportation choices to reduce air pollution.**



#### 4.4 Noise Pollution

Excessive noise can be a nuisance and is often considered an environmental problem. Excessive noise adversely affects the public welfare in a number of ways; interfering with sleep, conversation, and other activities. Intrusive noise may also significantly reduce the use and enjoyment of indoor and private outdoor areas. Additionally, excessive noise exposure causes a number of potentially serious health effects; including hearing loss, high blood pressure, heart disease, stroke, and ulcers.



**Figure 19 Automobile and truck traffic along major roadways is a significant source of noise pollution. Noise walls, as illustrated above, are constructed to mitigate noise in severe circumstances.**

##### **Baseline Conditions**

In Gaithersburg, sources of nuisance noise include public or quasi-public facilities such as highways, arterial roads, and railroads. These noise sources tend to be difficult to control. The most significant source of noise is generated by automobile and truck traffic along major roadways, such as Interstates 270 and 370. The *Environmental Standards* rely on Montgomery County standards for noise. The general guideline for the maximum outdoor noise levels, in a residential area, is a Ldn (day-night level) of 60 dBA. This is the guideline for the design and location of future development and is a goal for the reduction of existing noise when feasible.

##### **Noise Management Strategies**

The construction of noise barriers such as walls, berms, and/or vegetation have proven somewhat helpful in reducing noise from highways, but noise cannot be entirely eliminated. The following strategies are aimed at reducing the generation and effects of nuisance noise:

- **Require new development or redevelopment of land adjacent to a major noise source, such as mass transitways, interstates, or other major transportation routes, to conduct noise monitoring to determine ambient and peak noise levels prior to the submittal of a preliminary concept site plan.**
- **Require new development or redevelopments of land adjacent to a major noise source to utilize noise reduction and noise-compatible site design for noise abatement.**

- **Place parking lots, open spaces, garages, recreation areas and other non-habitable uses of the property in the noise affected area between the noise sources and residential units.**
- **Require acoustical treatment (soundproofing materials, double glaze windows) on affected structures when feasible.**
- **Construct physical barriers such as landscaped berms and noise walls when other options are infeasible and when compatible with aesthetic concerns.**
- **Screen and control noise sources such as parking, outdoor activities, and mechanical equipment.**
- **Increase setbacks for noise sources from adjacent dwellings.**
- **Control hours of operation, including deliveries and trash pickup, to minimize noise impacts.**

#### **4.5 Light Pollution**

The objective of any outdoor lighting system is to maximize visibility in performing a given task, while minimizing the amount of energy and associated costs used in producing the light. Appropriately designed and properly installed, outdoor lighting contributes to the safety and welfare of residents, customers, and visitors by increasing pedestrian and vehicular safety, enhancing a community's nighttime character, advertising commercial businesses, and providing security. A well-designed lighting system should produce no more lighting than is necessary for a given task and direct the light only where it is needed. Unfortunately, inappropriately designed outdoor lighting applications in both rural and urban areas have created an extensive light pollution problem throughout the nation. "Light pollution" refers to the undesired consequences of inappropriate outdoor lighting: glare, over-lighting, light trespass, sky glow, and wasted energy. "Glare" is caused by overly bright lights in street lamps, parking lot lights, and building floodlights. "Light trespass" is the light crossing over property lines and shining into adjacent yards and windows. "Skyglow" is the dull ruddiness in the sky that is caused by uplighting from street lamps, signs, billboards, and buildings. As our population increases, light pollution becomes an increasing problem. Light pollution disrupts sleep patterns, is linked to some cancers, impairs star gazing, and is devastating to the breeding, hunting, and migration habits of wildlife. The intent of reducing light pollution is to eliminate light trespass from the building and site,



**Figure 20 Inappropriate lighting can result in glare, light trespass, sky glow and waste energy.**

improve night sky access, conserve energy, and reduce development impact on nocturnal environments.

### **Baseline Conditions**

In 2001, the City recognized the need to reduce light pollution and began to research and develop outdoor lighting standards. In addition, House Joint Resolution 14 of 2001 Regular Session of the Maryland General Assembly created the "Task Force to Study Lighting Efficiency and Light Pollution in Maryland." The purpose of the Task Force was to study the cost, extent, and consequences of inefficient public lighting and light pollution in the State, and the benefits of alternative improvements. In addition to the Task Force's recommendations, the US Green Building Council's LEED™ checklist, which the City requires for new commercial, institutional, and high rise residential, also provides recommendations for ways to reduce light pollution. After holding a series of work sessions on outdoor lighting standards, the Mayor and City Council determined that the Task Force's March 2002 report and the outdoor lighting standards developed by staff should be used as criteria to evaluate lighting plans during the plan review process. Accordingly, developers are now required to submit a LEED checklist and photometric plans for most site plans.

### **Light Pollution Reduction Strategies**

According to the Task Force to Study Lighting Efficiency and Light Pollution in Maryland, March 2002, there is no single best answer to achieve efficient/cost effective lighting because there are numerous appropriate applications and equipment technologies. Therefore, the following Task Force recommendations, the outdoor standards, and LEED™ strategies should be used as guidelines during plan review to prevent and reduce light pollution.

- **Meet or provide lower light levels and uniformity ratios than those recommended by the Illuminating Engineering Society of North America (IESNA) *Recommended Practice Manual: Lighting for Exterior Environments* (RP-33-99),**
- **Requirement development and redevelopment to choose luminaires that distribute the light only where it is needed, minimizing light pollution and unnecessary energy consumption.**
- **Lighting plans should evaluate and consider appropriate lamp source color; lamp types that maximize visibility per lumen output, as well as maximizing lumen output per input watt of energy; lamps with longer life ratings; and appropriate efficient ballasts.**
- **Layout lights to avoid spillover onto adjacent property, and choose appropriate pole heights.**

- **Cutoff type luminaires** should be used wherever possible and appropriate. Light allowed to project skyward is wasted, both from an energy standpoint, and relative to maintaining a dark sky.
- **Safety** must be addressed as the primary concern; lighting should not be designed in such a way as to jeopardize safety.
- **Residential, low wattage, and temporary lighting systems** (such as those used for holidays or at nighttime work areas) should be exempted from such standards; but nonetheless, effort should be made to achieve energy efficiency and control of light.

#### 4.6 Solid Waste and Recycling

Solid waste management is an important environmental issue due to the fact that landfills and incinerators are often significant contributors to groundwater, soil, and air contamination. Practicing the 3 Rs-Reduce, Reuse, and Recycle; composting; and disposing of waste properly are important components of waste management.

- **Reduce** the amount and toxicity of the trash discarded. Source reduction, often called waste prevention, means consuming and throwing away less. Source reduction includes purchasing durable, long-lasting goods and seeking products and packaging that are as free of toxics as possible. Because source reduction actually prevents the generation of waste in the first place, it is the most preferable method of waste management.
- **Reuse** containers and products, repair broken items, donate or sell used goods. When shopping, choose reusables over disposables and avoid using products that are designed to be used only once or a few times. Reusing, when possible, is preferable to recycling because the item does not need to be reprocessed before it can be used again.
- **Recycle** as much as possible, which includes buying products with recycled content. These practices will limit the amount of pollution generated and ensure that it does not enter the environment. Recycling transforms materials that would otherwise become waste into valuable resources and generates a host of environmental, financial, and social benefits.
- **Composting** is the controlled decomposition of biodegradable organic materials into a soil-like material. Yard trimmings and food scraps make up



Figure 21 Placing yard waste in paper bags for compost collection can significantly reduce the amount of solid waste that is sent to the incinerator and the landfill.



about 25 percent of the waste U.S. households generate, so composting can greatly reduce the amount of waste that ends up in landfills or incinerators.

- **Household hazardous waste**, such as pesticides, car batteries, paint thinners and solvents, fluorescent bulbs, used motor oil, swimming pool chemicals, and oil-based paints can contaminate groundwater and soil and harm human health. Instead of putting hazardous materials in the garbage or pouring them down the drain, residents should bring them to Montgomery County's collection sites on the published dates, free of charge.

### Baseline Conditions

The City of Gaithersburg promotes waste reduction and recycling. The City contracts with a private hauler for the collection of newspapers, mixed paper, corrugated cardboard, commingled cans, glass containers, and plastic bottles. The recycling contractor also collects brush, branches, grass clippings, leaves and other yard trimmings when placed in biodegradable brown paper bags and set at the curb on regularly scheduled recycling days. For residents without recycling services, the City encourages residents to use the free and convenient recycling drop-off service at the Public Works facility on Saturdays. The facility accepts newspapers, commingled cans, glass, plastics, corrugated cardboard, magazines, catalogues, and telephone books. In addition, in order to prevent illegal dumping of automobile fluids down the storm drain, the City offers free 24-hour used oil and antifreeze collection at the Public Works facility on Rabbitt Road.



Figure 22 Gaithersburg's used oil and antifreeze recycling collection center is a free and easy service located on Rabbitt Road.

### Pollution Prevention Strategies

The following strategies are aimed at preventing and reducing solid waste.

- **Continue to participate in regional efforts to reduce solid waste.**
- **Require new development and redevelopment to provide accessible areas for the separation, collection, and storage of recyclables.**
- **Continue to educate and publicize recycling and the proper use and disposal of household hazardous wastes.**
- **Continue to publicize the used oil and antifreeze collection facility.**
- **Examine municipal operations and purchasing policies to reduce unnecessary consumption of natural resources.**

- **Develop a mandatory recycling program for multifamily apartments (e.g., research Montgomery County's policies, provide education and outreach, and evaluate enforcement options).**
- **Promote voluntary commercial recycling (e.g., survey existing operations, provide education and outreach, and consider incentives).**
- **Investigate incentives and disincentives to minimize solid waste from new construction, renovation, remodeling, and demolition projects and develop tools and strategies (e.g., Solid Waste Management and Recycling Plans) to minimize such waste.**

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## 6. APPENDICES

### Appendix A: Overview of the Fundamental Environmental Regulations and Policies Guiding the Planning Process in Gaithersburg, Maryland

Environmental Goal	Federal, State, and Local Mandates and Programs
Maintain water quality	<ul style="list-style-type: none"> <li>? Federal Clean Water Act</li> <li>? Resources Conservation and Recovery Act (RCRA)</li> <li>? Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)</li> <li>? MD Water Pollution Law (COMAR 26.08)</li> <li>? MD Erosion and Sediment Control Law (COMAR 26.17.01)</li> <li>? MD Stormwater Management Law (COMAR 26.17.02)</li> <li>? Countywide Stream Protection Strategies</li> <li>? Gaithersburg Environmental Standards for Development Regulation</li> <li>? Gaithersburg Sediment and Erosion Control and Stormwater Management Ordinance (Chapter 8)</li> <li>? Gaithersburg National Pollutant Discharge and Elimination System (NPDES) Phase II Permit</li> </ul>
Preserve wetlands and sensitive areas	<ul style="list-style-type: none"> <li>? Federal Clean Water Act</li> <li>? US Army Corps of Engineers Regulations</li> <li>? MD Non-tidal Wetlands Law (COMAR 26.23)</li> <li>? MD State Planning Act</li> <li>? Gaithersburg Environmental Standards for Development Regulation</li> </ul>
Provide for water and sewer service	<ul style="list-style-type: none"> <li>? MD Water Supply, Sewerage, Solid Waste, and Pollution Control Planning and Funding Law (COMAR 26.03)</li> <li>? Washington Suburban Sanitation Commission (WSSC)</li> </ul>
Minimize erosion and sedimentation	<ul style="list-style-type: none"> <li>? MD Erosion and Sediment Control Law (COMAR 26.17.01)</li> <li>? Gaithersburg Sediment and Erosion Control and Stormwater Management Ordinance (Chapter 8)</li> </ul>
Protect against flooding	<ul style="list-style-type: none"> <li>? Federal Emergency Management Agency</li> <li>? MD Stormwater Management Law (COMAR 26.17.02)</li> <li>? Gaithersburg Floodplain Management Ordinance (Chapter 10)</li> <li>? Gaithersburg Sediment and Erosion Control and Stormwater Management Ordinance (Chapter 8)</li> </ul>
Plan for forest conservation	<ul style="list-style-type: none"> <li>? MD Forest Conservation Law (COMAR 08.19)</li> <li>? Gaithersburg Trees and Vegetation Ordinance (Chapter 21)</li> <li>? Gaithersburg Trees and Forest Conservation Ordinance (Chapter 22)</li> </ul>
Preserve unique and beautiful natural areas	<ul style="list-style-type: none"> <li>? MD Scenic Rivers Act</li> <li>? MD Greenways Program</li> <li>? MD Rural Legacy Program</li> </ul>
Preserve biodiversity	<ul style="list-style-type: none"> <li>? Federal Endangered Species Act</li> <li>? MD Wildlife Law (COMAR 08.03)</li> <li>? MD Threatened and Endangered Species Law (COMAR 08.03.08)</li> <li>? Maryland Planning Act</li> </ul>

Place utilities sensitively	? Gaithersburg Environmental Standards for Development Regulation ? Gaithersburg Excavation of Underground Utility Facilities Ordinance (Chapter 9)
Protect air quality	? Federal Clean Air Act ? Maryland Air Quality Law (COMAR 26.11) ? Maryland State Implementation Plan (SIP) ? Montgomery County Air Quality Control Ordinance (Chapter 3)
Provide for solid waste management	? Montgomery County Waste Management Plan ? Gaithersburg Refuse and Garbage Ordinance (Chapter 18)
Manage noise	? Montgomery County Planning Board Technical Noise Guidelines ? Gaithersburg Offenses—Miscellaneous Ordinance (Chapter 15)

## Appendix B: Central Maryland Native Plants

This following is a general list of common native species found to Central Maryland. Plant highlighted with “\*” indicate the plant species is highly ornamental and “\*\*” indicate the plant species is of special importance for wildlife

*This information is adapted from Native Plants for Central Maryland Landscapes (Piedmont and Inner Coastal Plain), a 1999 publication compiled by Louisa Thompson for Maryland Cooperative Extension. The entire text is available online at: <http://www.mdflora.org/publications/natplants.html>.*

### Riverbank, Wetland, and Bottomland Native Plants

Type	Common Name	Scientific Name	Description
Tall Trees	Red Maple *	<i>Acer rubrum</i>	Orange to red fall foliage
	Silver Maple	<i>Acer saccharinum</i>	Grows only on riverbanks and near springs
	River Birch *	<i>Betula nigra</i>	Peeling, pinkish bark is interesting and attractive, especially in winter
	Bitternut Hickory	<i>Carya cordiformis</i>	
	White Ash	<i>Fraxinus americana</i>	
	Sycamore *	<i>Platanus occidentalis</i>	Peeling bark, snow-white crown stands out in winter
	Swamp White Oak	<i>Quercus bicolor</i>	Grows mainly on the coastal plain
	Pin Oak	<i>Quercus palustris</i>	Pyramidal shape, lower branches droop to the ground
	American Elm	<i>Ulmus americana</i>	Still common in natural sites despite Dutch elm disease
Medium Trees	Box Elder (Maple)	<i>Acer negundo</i>	
	Persimmon	<i>Diospyros virginiana</i>	
	Green Ash	<i>Fraxinus pennsylvanica</i> var. <i>integerrima</i>	
	Sweetgum *	<i>Liquidambar styraciflua</i>	Star shaped leaves, bright fall foliage (yellow, orange, or red)
	Black or Sour Gum (Tupelo) *	<i>Nyssa sylvatica</i>	Bright red fall foliage
	Willow Oak	<i>Quercus phellos</i>	Leaves are willowlike
	Black Willow	<i>Salix nigra</i>	
	Slippery Elm	<i>Ulmus rubra</i>	
Small Trees	Pawpaw	<i>Asimina triloba</i>	
	Ironwood/Hornbeam *	<i>Carpinus caroliniana</i>	Gracefully twisted trunk (slow growing)
	Serviceberry *	<i>Amelanchier canadensis</i>	Lovely white flowers in early spring
	Hackberry **	<i>Celtis occidentalis</i>	Larval host for 7 species of <i>Lepidoptera</i> ; sole larval host for the rare Hackberry Butterfly
	Fringetree *	<i>Chionanthus virginicus</i>	Spectacular large clusters of aromatic white flowers in late spring
	Sweetbay Magnolia *	<i>Magnolia virginiana</i>	Evergreen, white flowers in June



Type	Common Name	Scientific Name	Description
Shrubs	Smooth Alder	<i>Alnus serrulata</i>	
	Buttonbush	<i>Cephalanthus occidentalis</i>	
	Sweet Pepperbush * **	<i>Clethra alnifolia</i>	More common on Eastern shore– showy white flower spikes in summer, very attractive to butterflies
	Hazelnut	<i>Corylus americana</i>	
	Silky Dogwood	<i>Cornus amomum</i>	
	Witch Hazel	<i>Hamamelis virginiana</i>	
	Inkberry *	<i>Ilex glabra</i>	Evergreen holly, grows to 6-8'
	Winterberry *	<i>Ilex verticillata</i>	Deciduous holly, bright red berries in winter, grows to 6-10'
	American Elderberry	<i>Sambucus canadensis</i>	Huge cymes of white flowers in June
	Southern Arrowwood	<i>Viburnum dentatum</i>	Found on coastal plain
	Swamp Azalea *	<i>Rhododendron viscosum</i>	Beautiful, aromatic white flowers in June
	Swamp Rose *	<i>Rosa palustris</i>	Single pink flowers
Emergent Herbaceous Plants	Sweet Flag	<i>Acorus calamus</i>	
	Hardy Hibiscus *	<i>Hibiscus moscheutos</i>	Huge flowers
	Blue Flag *	<i>Iris versicolor</i>	Large blue flowers
	Yellow Pond Lily	<i>Nuphar advena</i>	
	Fragrant Water Lily *	<i>Nymphaea odorata</i>	White flowers; our only native water lily
	Lotus Lily *	<i>Nelumbo lutea</i>	Small pale yellow flowers; interesting seedpods
	Pickrelweed	<i>Pontederia cordata</i>	
	Arrowhead	<i>Sagittaria latifolia</i>	
	Lizard's Tail *	<i>Saururus cernuus</i>	Tail-like white flower spikes
Herbaceous Plants for Wet Soil	Green Dragon	<i>Arisaema dracontium</i>	
	Wild Ginger	<i>Asarum canadense</i>	A deciduous ground cover
	Swamp Milkweed **	<i>Asclepius incarnata</i>	Pink flowers, larval host for monarch butterfly
	New England Aster	<i>Aster novae-angliae</i>	Purple flowers bloom 2-3 months in fall
	Trout Lily (Dogtooth Violet)	<i>Erythronium americanum</i>	Small yellow lily-shaped flowers in early spring
	Boneset	<i>Eupatorium perfoliatum</i>	A shorter, white-flowered relative of Joe Pye weed
	Joe Pye Weed **	<i>Eupatorium fistulosum, E. maculatum, E. purpureum, E. dubium</i>	Extraordinary huge clusters of mauve flowers, up to 8' tall, very attractive to butterflies
	Cardinal Flower **	<i>Lobelia cardinalis</i>	Bright red flowers, attractive to hummingbirds
	Virginia Bluebells	<i>Mertensia virginica</i>	Striking blue flowers in spring
	Wild Blue Phlox	<i>Phlox divaricata</i>	Pale blue or pink flowers in spring
	Green Coneflower	<i>Rudbeckia laciniata</i>	Yellow flowers with green cones, tall
	New York Ironweed	<i>Vernonia noveboracensis</i>	Magenta to purple flowers in large clusters
	Yellow Violet	<i>Viola pennsylvanica</i>	
	Golden Alexanders	<i>Zizia aptera</i>	Yellow flowers in umbels (like parsley or Queen Anne's lace)

### Native Plants for Rich, Moist Woods

Type	Common Name	Scientific Name	Description
Tall Trees	White Oak *	<i>Quercus alba</i>	Shaggy bark on the middle portion of the trunk makes it ornamental in winter; excellent shade tree; leaves have rounded lobes. White oak acorns are sweet and sprout quickly so are eaten in fall
	Southern Red Oak	<i>Quercus falcata</i>	Leaves have few lobes (pointed); bark appears striped; red and black oak acorns have a lot of tannin and are buried by squirrels to mellow before eating
	Northern Red Oak	<i>Quercus rubra</i>	Leaves have pointed lobes; bark appears striped
	Black Oak	<i>Quercus velutina</i>	Very large leaves with pointed lobes
	Red Maple *	<i>Acer rubrum</i>	Attractive tree with red/orange fall foliage, but now rapidly expanding out of its original swamp habitat
	Mockernut Hickory *	<i>Carya tomentosa</i>	Very large terminal leaflet, aromatic foliage turns gold in late fall
	American Beech * **	<i>Fagus grandifolia</i>	Pale gray bark; young trees keep their leaves through the winter; beechnuts are high-quality food for mammals and large birds
	White Ash	<i>Fraxinus americana</i>	
	Tulip Poplar	<i>Liriodendron tulipifera</i>	A "pioneer" tree, it needs full sun and shades out (and drops) its own lower branches. Don't allow it to grow close to a house.
Medium Trees	Persimmon *	<i>Diospyros virginiana</i>	Checkered bark and fruits hanging on tree provide winter interest
	American Holly *	<i>Ilex opaca</i>	Evergreen, handsome pyramidal shape when grown in the open, but found as an understory tree in the wild
	Black or Sour Gum (Tupelo) *	<i>Nyssa sylvatica</i>	Bright red fall foliage
	Black Cherry * **	<i>Prunus serotina</i>	Flowers are ornamental; fruits are staple food for many birds; leaves are larval host for spring azure, Eastern tiger swallowtail, and red-spotted purple butterfly and many other butterfly and moth species. Black cherry is a pioneer tree.
	Sassafras * **	<i>Sassafras albidum</i>	Mitten-shaped leaves, brilliant orange fall foliage; larval host for Spicebush Swallowtail butterfly
	Red Mulberry **	<i>Morus rubra</i>	Hard to find because of competition from non-native white mulberry. The native has large leaves with few or no lobes; the exotic has two or more lobes on most of its leaves, and usually has dark purple fruit.

Type	Common Name	Scientific Name	Description
Small Trees	Dogwood *	<i>Cornus florida</i>	
	Redbud *	<i>Cercis canadensis</i>	Deep pink, pea-like flowers all along stem, heart-shaped leaves
	Black Haw *	<i>Viburnum prunifolium</i>	Creamy white, flat flower clusters in May; extremely scaly light brown bark provides winter interest
	Serviceberry *	<i>Amelanchier canadensis</i>	Lovely white flowers in early spring
	Hackberry **	<i>Celtis occidentalis</i>	Larval host for 7 species of <i>Lepidoptera</i> ; sole larval host for the rare Hackberry Butterfly
	Fringetree *	<i>Chionanthus virginicus</i>	Spectacular large clusters of aromatic white flowers in late spring
Shrubs	Spicebush * **	<i>Lindera benzoin</i>	Most common shrub in the piedmont – tiny yellow flowers all along stem in late March, red berries in winter; larval host for Spicebush Swallowtail butterfly
	Red Chokeberry *	<i>Aronia arbutifolia</i>	White flowers in spring, red berries often last all winter
	Strawberry Bush	<i>Euonymus americanus</i>	
	Virginia Sweetspire * **	<i>Itea virginica</i>	Fragrant white flower spires; height 3-5'; good butterfly nectar plant
	Smooth Arrowwood	<i>Viburnum recognitum</i>	
Herbaceous Plant for Shade-Ferns	Maidenhair Fern *	<i>Adiantum pedatum</i>	Leaves attached to an unusual semicircular stem
	Sensitive Fern	<i>Onoclea sensibilis</i>	Leaflets rather amorphous in shape
	Common Polypody	<i>Polypodium virginianum</i>	
	Christmas Fern *	<i>Polystichum acrostichoides</i>	Most common – evergreen
	New York Fern	<i>Thelypteris noveboracensis</i>	Narrows toward base as well as toward tip
Herbaceous Plant for Shade-Evergreen Ground Cover	Partridgeberry	<i>Mitchella repens</i>	Tiny leaves, covers ground slowly, thinly
	Golden Ragwort *	<i>Senecio aureus</i>	Handsome, scalloped, kidney-shaped leaves; golden dandelion-like flowers on tall stems in spring; covers densely, spreads quickly – may be too aggressive in sun

Type	Common Name	Scientific Name	Description
Spring Wildflowers*	Jack in the Pulpit	<i>Claytonia virginiana</i>	Corms provide winter food for small mammals
	Cut-leaved and Slender Toothwort	<i>Dentaria laciniata</i>	
	Dutchman's Breeches **	<i>Dicentra cucullaria</i>	Corms provide winter food for small mammals
	Wild Geranium	<i>Geranium maculatum</i>	
	Round- and Sharp-lobed Hepatica	<i>Hepatica americana</i>	
	Virginia Waterleaf	<i>Hydrophyllum virginianum</i>	
	Showy Orchis	<i>Orchis spectabilis</i>	
	Smooth Sweet Cicely **	<i>Osmorhiza longistylis</i>	Carrot family member, presumed to be a native larval host of Eastern black swallowtail butterfly; flowers small, not showy
	Mayapple	<i>Podophyllum peltatum</i>	
	Solomon's Seal	<i>Polygonatum biflorum</i>	
	Bloodroot	<i>Sanguinaria canadensis</i>	
	False Solomon's Seal	<i>Smilacina racemosa</i>	
	Star Chickweed	<i>Stellaria pubera</i>	
	Perfoliate Bellwort	<i>Uvularia perfoliata</i>	
	Common Blue Violet	<i>Viola papilionacea</i>	
Summer Wildflowers*	Black Cohosh **	<i>Cimicifuga racemosa</i>	Larval host for the rare Appalachian Blue butterfly; blooms in June
Fall Wildflowers	Common Blue Wood Aster	<i>Aster cordifolius</i>	Blue flowers, often with pink centers
	Upland Boneset*	<i>Eupatorium sessifolium</i>	A white-flowered Joe Pye weed
	Blue-stem Goldenrod	<i>Solidago caesia</i>	One of the prettier goldenrods, with a long string of small flower clusters in the leaf axils



### Native Plants for Steep, Rocky Slopes

Type	Common Name	Scientific Name	Description
Tall Trees	Chestnut Oak **	<i>Quercus prinus</i>	
	Pignut Hickory **	<i>Carya glabra</i>	
	American Beech **	<i>Fagus grandifolia</i>	
Medium Trees	Sassafras **	<i>Sassafras albidum</i>	Larval host for spicebush swallowtail butterfly
Small Trees	American Chestnut	<i>Castanea dentata</i>	Chestnuts still re-sprout from the roots, but rarely grow more than 20' tall before they are killed by the blight. However, research is under way to allow the trees to survive.
	Redbud * **	<i>Cercis canadensis</i>	Can grow on steep slopes as long as the soil is rich (e.g., has some limestone in it) and well-watered; the nectar source for Henry's elfin butterfly, larval host for several butterflies and moths.
Shrubs	Huckleberries	<i>Gaylussacia species</i>	Can tolerate acid soil but grow wherever there is little competition, e.g., on these eroded slopes
	Witch Hazel **	<i>Hamamelis virginiana</i>	Found next to streams, including on steep slopes – sole nectar source for the night-flying moth that pollinates it in fall.
	Mountain Laurel *	<i>Kalmia latifolia</i>	Important for erosion control, as it forms large colonies on the steepest slopes.
	Wild Pink Azalea *	<i>Rhododendron periclymenoides</i>	Deciduous, but a beautiful shrubs.
	Highbush Blueberry	<i>V. corymbosum</i>	
	Maple-Leaf Viburnum	<i>Viburnum acerifolium</i>	
Groundcovers	Striped or Spotted Wintergreen	<i>Chimaphila maculata</i>	
	Trailing Arbutus *	<i>Epigaea repens</i>	
Herbaceous Plants	Maidenhair Fern	<i>Adiantum pedatum</i>	FronDS grow from outer side of semicircular stem
	Rue Anemone	<i>Anemonella thalictroides</i>	White flowers in spring
	Alumroot	<i>Heuchera americana</i>	Evergreen foliage, sprays of greenish or reddish flowers in spring
	Christmas Fern	<i>Polystichum acrostichoides</i>	Evergreen fern, needs moisture
	Wild Stonecrop	<i>Sedum ternatum</i>	White flowers in spring, evergreen fleshy foliage
	Wild Pink	<i>Silene caroliniana</i>	Pink flowers in spring
	Star Chickweed	<i>Stellaria pubera</i>	White flowers in spring, exceptionally showy

### Native Plants for Dry Ridgetops and Sunny Sites

Type	Common Name	Scientific Name	Description
Tall Trees	Scarlet Oak * **	<i>Quercus coccinea</i>	The brightest red fall foliage of our indigenous oaks
	Tulip Poplars		
	Red Maples		
Medium Trees	Black Cherry * **	<i>Prunus serotina</i>	A pioneer tree on cleared sites, also grows in shade – flowers are quietly ornamental, not showy; fruits are staple food for many birds; leaves are larval host for spring azure, Eastern tiger swallowtail, and red-spotted purple butterfly and other butterfly and moth species.
	Post Oak	<i>Quercus stellata</i>	Found on very poor, dry soils
	Red Mulberry **	<i>Morus rubra</i>	Very hard to find because of competition from the non-native White Mulberry, which may also be the source of the root disease that kills off many of the natives. The native has large leaves with few or no lobes; the exotic has smaller leaves with two or more lobes on most of them, and usually has dark purple fruit.
Small Trees	Redbud *	<i>Cercis canadensis</i>	deep-pink pea-like flowers all along stem, heart-shaped leaves
	Dogwood *	<i>Cornus florida</i>	although in the wild it grows in partial shade, it also thrives in sun and is actually more likely to escape or survive the anthracnose disease because of lower humidity
	Black Haw *	<i>Viburnum prunifolium</i>	creamy white, flat flower clusters in may; extremely scaly light brown bark provides winter interest
Shrubs	Pasture Rose *	<i>Rosa carolina</i>	single pink flowers, usually solitary, sometimes in small clusters
Groundcovers	Moss Phlox *	<i>Phlox subulata</i>	thrives in minimal soil with excellent drainage; this is available at garden centers. In the wild, the flowers are usually white or very faintly colored.

## Appendix C: Invasive Non-Native Plants in the Mid-Atlantic Region

The following is a list of invasive non-native plants and weeds which are causing significant changes to natural areas in the Mid-Atlantic. Planting and propagating these species should be avoided. Following each section, in grey, is a list of alternative native plants to be planted as substitutes for these invasive species. These alternatives are native plants, well adapted and needing little care, attractive to birds and butterflies, and an important part of the food web for our indigenous species. Additional information regarding invasive species control measures is available online.

*This information is adapted from Control of Invasive Non-Native Plants: A Guide for Gardeners and Homeowners in the Mid-Atlantic Region (March, 1999) compiled by Louisa Thompson, Master Gardener Consultant, for Maryland Cooperative Extension. The text in its entirety is available online at <http://www.mdflora.org/publications/invasives.htm>*

Type	Common Name	Scientific Name	Description	Detrimental Effects
<b>Most Invasive Non-Native Weeds</b>	Garlic Mustard	<i>Alliaria petiolata</i> , <i>A. officinalis</i>	White-flowered biennial with rough, scalloped leaves (kidney-, heart- or arrow-shaped), recognizable by the smell of garlic and taste of mustard when its leaves are crushed	
	Japanese or Vietnamese Stilt Grass, Eulalia	<i>Microstegium vimineum</i>	Lime-green, with a line of silvery hairs down the center of its 2-3" blade	Tolerates sun or dense shade and quickly invades areas left bare or disturbed by tilling or flooding; An annual grass, it builds up a large seed bank in the soil
	Mile-a-Minute Vine, Devil's Tail Tearthumb	<i>Polygonum perfoliatum</i>	Rapidly growing annual vine with triangular leaves, barbed stems, and turquoise berries spread by birds	Quickly covers and shades out herbaceous plants
	Japanese Perilla, Beefsteak Plant	<i>Perilla frutescens</i>	Salad plant, member of the mint family; An odd odor, like raw beef when you rub it	Extremely invasive by wind-borne seeds
	Spotted Knapweed	<i>Centaurea maculosa</i>	A biennial with thistle-like flowers	
	Canada thistle, Bull thistle	<i>Cirsium arvense</i> , <i>C. Vulgare</i>	Exotic thistles are more common than natives. If unidentifiable, it is better to remove it	

Type	Common Name	Scientific Name	Description	Detrimental Effects
<b>Medium to Tall Invasive, Non-Native Trees</b>	Norway Maple	<i>Acer platanoides</i>	Large leaves similar to sugar maple, white sap when stalk is broken, yellow fall foliage; some cultivars have red fall foliage	Suppresses growth of grass, garden plants, and forest understory; windborne seeds can germinate and grow in deep shade
	Tree of Heaven	<i>Ailanthus altissima</i>	Long compound leaves with 11-25 lance-shaped leaflets smell like peanut butter or burnt coffee when crushed	Produces huge quantities of windborne seeds, grows rapidly and in poor conditions, and secretes a toxin that kills other plants; once established, this tree cannot be removed by mechanical means alone
	Sawtooth Oak	<i>Quercus acutissima</i>	Oval leaves with sawtooth edges and huge acorns	Often recommended for wildlife, this tree displaces indigenous forest trees
<b>Recommended Native Shade Trees</b>	White Oak	<i>Quercus alba</i>	Widely adapted shade trees; other oaks and hickories are suited to very dry, wet, or steep sites	---
	Southern Red Oak	<i>Q. rubra</i> , <i>Q. falcata</i>		---
	Mockernut Hickory	<i>Carya tomentosa</i>		---
	Tupelo (Black or Sour Gum)	<i>Nyssa sylvatica</i>	Brilliant red fall foliage and small fruits eaten by birds	---
<b>Small to Medium Invasive, Non-Native Trees</b>	Empress Tree, Princess Tree	<i>Paulownia tomentosa</i>	Large panicles of lavender flowers, like upside-down wisteria, identify this tree in spring; the large brown seed capsules remain all year. The leaves are very large and heart-shaped	Winged seeds allow it to spread deep into undeveloped areas, though it needs some sunlight and is most common along trails and waterways. It grows very rapidly and sprouts readily from roots and cut stumps
	Mimosa	<i>Albizia julibrissin</i>	Has garish pink flowers in summer and feathery compound leaves	Spreads slowly by wind-borne seedpods, or in water or fill-dirt. It re-sprouts when cut or burned
	Siberian Elm	<i>Ulmus pumila</i>	A fast-growing medium-height tree; small oval leaves have a single tooth	Displaces our native elms, which are already under pressure from Dutch elm disease; forms dense thickets under which nothing else grows
	Russian Olive, Autumn Olive	<i>Eleagnus angustifolium</i> , <i>E. umbellata</i>		Formerly recommended for erosion control and wildlife value, these have proved highly



Type	Common Name	Scientific Name	Description	Detrimental Effects
				invasive and diminish the overall quality of wildlife habitat
	Cherry	<i>Prunus avium, P. cerasus</i>	Edible and ornamental	Displaces our native fruit trees
	Bradford Pear/Ornamental Pears	<i>Pyrus calleryana</i>		Displaces our native fruit trees; self-sterile but can pollinate other cultivars, now spreading rapidly from street plantings
	White Mulberry	<i>Morus alba</i>	The fruits may be white, purple, or black; leaves are lobed	Displaces our native fruit trees. Our delicious native red mulberry, which has very large, usually unlobed leaves, is dying out from a root disease carried by white mulberry
<b>Recommended Small Native Ornamental Trees</b>	Serviceberry	<i>Amelanchier spp.</i>	Beautiful flowering trees that also produce fruit for birds	---
	Fringetree	<i>Chionanthus virginicus</i>		---
	Black Haw	<i>Viburnum prunifolium</i>		---
	Red Chokeberry	<i>Aronia arbutifolia</i>		---
	Red Mulberry	<i>Morus rubra</i>	A beautiful flowering tree that also produce fruit for birds; Plant red mulberry if there are no white mulberries nearby that could transmit disease to them	---
<b>Recommended Native Trees for Hedges</b>	American Hazelnut	<i>Corylus americana</i>	Makes an excellent hedge	---
	Slippery Elm	<i>Ulmus rubra</i>	A good substitute for Siberian elm in damp soils	---
	Staghorn or Shining Sumac	<i>Rhus typhina, R. copallina</i>	Form thickets on sunny, dry sites; keep suckers in check by mowing	---
<b>Invasive, Non-Native Shrubs</b>	Multiflora Rose	<i>Rosa multiflora</i>	Covered with white flowers in June. (Our native roses have fewer flowers, mostly pink.) Distinguish multiflora by its size, and by the presence of very hard, curved thorns, and a fringed edge to the leaf stalk	Formerly recommended for erosion control, hedges, and wildlife habitat, it becomes a huge shrub that chokes out all other vegetation and is too dense for many species of birds to nest in, though a few favor it. In shade, it grows up trees like a vine

Type	Common Name	Scientific Name	Description	Detrimental Effects
	Bush Honeysuckles including Belle, Amur, Morrow's, and Tatarian	<i>Lonicera spp.</i>	In our region, assume that any honeysuckle is exotic unless it is a scarlet-flowered vine	Bush honeysuckles create denser shade than native shrubs, reducing plant variety and eliminating nest sites for many species
	Japanese Spiraea	<i>Spiraea japonica</i>		
	Privet	<i>Ligustrum</i>		
	Burning Bush, Winged Euonymus, Winged Wahoo	<i>Euonymus alatus</i>	Identified by wide, corky wings on the branches	Another species called burning bush, <i>E. atropurpureus</i> is indigenous to the Appalachians, and a piedmont euonymus called strawberry bush ( <i>e. americanus</i> )
	Japanese Barberry	<i>Berberis thunbergii</i>	Red and green varieties.	
	Spicebush	<i>Lindera benzoin</i>	Covered with tiny yellow flowers in March, is our most common native shrub. It needs rich soil	---
<b>Recommended Native Shrubs</b>	Strawberry Bush	<i>Euonymus americanus</i>	Needs rich soil	---
	Maple-leaf Viburnum	<i>Viburnum acerifolium</i>	Suited to dry shade and thinner soil	---
	Arrowwoods	<i>Viburnum dentatum</i> , <i>V. recognitum</i> , <i>V. nudum</i>	Plants grow in moist soil	---
	Wild Hydrangea	<i>Hydrangea arborescens</i>	Parent of some cultivated varieties, is a somewhat vining shrub	---
	Highbush and Lowbush Blueberry	<i>Vaccinium corymbosum</i> , <i>V. vacillans</i>	Need very acidic soil. They tolerate shade but fruit best in sun. Both turn red in fall	---
<b>Invasive, Non-Native Vines</b>	Kudzu	<i>Pueraria lobata</i>	Has large lobed leaves in groups of three, thick stems, flowers that resemble wisteria, and hairy, bean-like seedpods in fall	It grows extremely rapidly both above and below ground, and can pull down trees
	Japanese Honeysuckle	<i>Lonicera japonica</i>	Has gold-and-white flowers with a sweet scent and nectar in June	Probably the familiar honeysuckle of your childhood. It is a rampant grower that spirals around trees, often strangling them
	Wisteria; Chinese and Japanese	<i>Wisteria sinensis</i> , <i>W. floribunda</i>	Woody vines	Both become heavy and can pull down a large tree
	Oriental	<i>Celastrus</i>	Has its flowers and	Has almost completely

Type	Common Name	Scientific Name	Description	Detrimental Effects
	Bittersweet	<i>orbiculatus</i>	bright orange seed capsules in clusters all along the stem, while the native species bears them only at the branch tips	displaced American bittersweet (C. scandens)
	Porcelain Berry	<i>Ampelopsis brevipedunculata</i>	Has small, hard fruits in a loose, flat cluster that turn from white to yellow, lilac, green, and finally a beautiful turquoise blue.	
	English Ivy	<i>Hedera helix</i>	Spreads along the ground and occasionally by fruits	Grows up trees and can eventually pull them down
	Wintercreeper	<i>Euonymus fortunei</i>		Control methods are the same as for English Ivy, but Garlon is not effective; glyphosate mixed with extra sticker-spreader may be
	Vinca, Periwinkle	<i>Vinca minor</i>		
<b>Recommended Native Ornamental Vines</b>	American bittersweet	<i>Celastrus scandens</i>	Bears flowers and seed capsules only at the branch tips, has been almost completely displaced by the Asian species. To preserve it, give it preference, <u>except</u> where its exotic counterpart is present, because the two hybridize	---
	Trumpet honeysuckle	<i>Lonicera sempervirens</i>	Semi-evergreen twining shrub with tubular red flowers attractive to hummingbirds, is uncommon but indigenous to the piedmont	---
	Native wisteria	<i>Wisteria frutescens</i>	Much less aggressive than the introduced ones, can be grown from Maryland south	---
	Trumpet vine	<i>Campsis radicans</i>	Has dramatic flowers attractive to hummingbirds	Be aware that both are aggressive growers
	Virginia creeper	<i>Parthenocissus quinquefolia</i>	Spectacular red fall foliage	
	Native grapes	<i>Vitis spp.</i>	Provide an enormous amount of food for birds	Are aggressive and not ornamental
<b>Invasive Non-Vining Ground</b>	Crown Vetch	<i>Coronilla varia</i>	Striking pink flowers; bare woody stems are	Often planted along highways, its seeds

Type	Common Name		Scientific Name	Description	Detrimental Effects
Covers				unattractive in winter	spread invasively
		Creeping Bugleweed	<i>Ajuga reptans</i>	Spread by windborne seeds as well as by runners	Grow in sun and shade and are common lawn weeds which have spread to woods and wetlands
		Ground Ivy			
		Gill-Over-the-Ground			
		Creeping Charlie	<i>Glechoma hederacea</i>		
		Henbit	<i>Lamium amplexicaule</i>		
		Purple Dead Nettle	<i>L. purpureum</i>		
		Mints (Spearmint)	<i>Mentha spicata</i>	Recognize mints by square stems and minty smell when crushed; Plant culinary mints in containers; prevent from spreading out drainage holes or over the top.	Grow in sun and shade and are common lawn weeds which have spread to woods and wetlands; spread by windborne seeds as well as by runners
		Indian Strawberry	<i>Duchesnea indica</i>	Shade-tolerant plant from India	Spreads by fruit and runners
		Running Bamboos (many species and genera)	<i>Phyllostachys</i> , <i>Bambusa</i> , and <i>Pseudosasa</i> are the most destructive	Plant bamboos only in containers, never in open soil. Prevent from spreading out drainage holes	Many bamboos send runners great distances, under pavement and edging. Once established, they form impenetrable thickets that are almost impossible to eradicate
Recommended Native Ground Covers	Evergreen	Golden ragwort	<i>Senecio aureus</i>	Showy yellow flowers in spring; grow in moist shade	---
		Green-and-Gold	<i>Chrysogonum virginianum</i>		---
		Wild Stonecrop	<i>Sedum ternatum</i>	Lacy white flowers; it grows in thin, rocky soil in light shade	---
		Moss Phlox	<i>Phlox subulata</i>	Has a looser form in the wild, and usually has white flowers; it tolerates very poor soil but needs good drainage	---
	Semi-evergreen	Allegheny Spurge	<i>Pachysandra procumbens</i>	Indigenous to the mountains but will grow here. It looks much like its Japanese cousin	---
	Deciduous	Wild Ginger	<i>Asarum canadense</i>	Has kidney-shaped leaves that seem to sparkle in spring. Not a culinary plant, its roots do have a gingery scent. It needs moist shade	---

Type	Common Name		Scientific Name	Description	Detrimental Effects
	Bamboo Alternatives	Giant Cane	<i>Arundinaria gigantea</i>	A well-behaved native bamboo, is indigenous to damp woods and swamps on the coastal plain. Elsewhere, use native grasses (see below) or shrubs (see above)	---
<b>Invasive Wetland Plants</b>	Common Reed		<i>Phragmites australis</i> , formerly <i>P. communis</i>	A tall ornamental grass with lovely plumes, usually white or tan	Although the species is indigenous, a particularly aggressive strain, probably introduced or a hybrid, has escaped from natural controls and taken over many formerly diverse wetlands. It is also seen in roadside ditches
	Giant Reed		<i>Arundo donax</i>	Can grow to 20' tall	Chokes waterways from Virginia south
	Japanese Knotweed, Mexican Bamboo		<i>Polygonum cuspidatum</i>	Can grow in shade. The stems have knotty joints, reminiscent of bamboo. It grows 6-10' tall and has large pointed oval or triangular leaves	
	Purple Loosestrife		<i>Lythrum salicaria</i> , <i>L. virgatum</i>	a handsome garden plant, has tall spikes of magenta flowers over a long bloom season	Often marketed as sterile, it is at best self-sterile, i.e., it can be pollinated by plants you may not be aware of, growing nearby. A single plant can produce up to a million seeds. Like <i>Phragmites</i> , it chokes out all competitors and has taken over millions of acres of wetland in the US.
	Lesser Celandine, Celandine Buttercup		<i>Ranunculus ficaria</i>	Has spread from gardens to carpet our floodplains with small yellow flowers in spring	It comes up in winter, giving it a head start over most native spring wildflowers
<b>Recommended Native Wetland Plants for Water Gardens</b>	Turtlehead		<i>Chelone glabra</i>	Also use native reeds, rushes, and sedges	---
	Lizard's Tail		<i>Saururus cernuus</i>		---
	Cardinal Flower		<i>Lobelia cardinalis</i>		---
	New York Ironweed		<i>Vernonia noveboracensis</i>		---
	Blue Flag		<i>Iris versicolor</i>		---
	Virginia Bluebells		<i>Mertensia virginica</i>		---



Type	Common Name	Scientific Name	Description	Detrimental Effects
	Wild Blue Phlox	<i>Phlox divaricata</i>		---
	Arrowhead	<i>Sagittaria latifolia</i>		---
	Pickereelweed	<i>Pontederia cordata</i>		---
<b>Invasive Ornamental Grasses</b>	Pampas Grass	<i>Cortaderia selloana</i> and <i>C. jubata</i>		Have been the most invasive. Those with heavy seeds are less likely to spread
	Japanese Silver Grass	<i>Miscanthus sinensis</i>		
	Reed Canary Grass	<i>Phalaris arundinacea</i>		
<b>Recommended Native Grasses</b>	Indian Grass	<i>Sorghastrum nutans</i>	Native grasses provide nest sites for meadow birds, as well as food, cover, and shelter for a wide variety of animals. In the garden, they offer textural contrast, and fall and winter interest	---
	Big Bluestem	<i>Andropogon gerardii</i>		---
	Purple Top	<i>Triodia flava</i>		---
	Switch Grass	<i>Panicum virgatum</i>		---
	Little Bluestem	<i>Schizachyrium scoparium</i>		----
	Bottlebrush	<i>Hystrix patula</i>		---
	Wild Oats	<i>Uniola latifolia</i>		---

## Appendix D: Endangered Species of Gaithersburg

Maryland Department of Natural Resources has identified habitat within Gaithersburg with the potential to support the following rare and threatened plant and animal species. Additional information regarding current and historical rare, threatened, and endangered plant species of Montgomery County, Maryland is available at Maryland Department of Natural Resources Wildlife and Heritage Service website at: <http://www.dnr.state.md.us/wildlife/rtemontgomeryplants.html>

### 1. *Calystegia spithamea*, Low Bindweed - rare (1951)

*Preferred habitat:* old, dry fields; open, dry, deciduous woods on limestone; shale barren; oak-pine woods margin; and gravel/sand railroad embankment.

*Source:* various occurrence records in the Maryland Natural Heritage Program database.



### 2. *Cistothorus platensis*, Sedge Wren - threatened (1978)

*Preferred habitat:* wet or boggy meadows, sedge marshes; streamside thickets in grasslands or fields.

*Source:* Committee on classification and nomenclature. 1983. Checklist of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, KA.

### 3. *Lygodium palmatum*, Climbing Fern - threatened (1907)

*Preferred habitat:* wet thickets in sandy or acid soil; low shaded, moist to wet, high acid soils of open woods and watersides; borders of low woods.

*Sources:*

Radford, A.E., H.E. Ahles, and C.R. Bell. 1964. Manual of the vascular flora of the Carolinas. University of North Carolina Press, Chapel Hill.

Hough, M.Y. 1983. New Jersey wild plants. Harmony Press, Harmon, N.J.  
Maryland Natural Heritage Program botanists.



### 4. *Scutellaria leonardii*, Leonard's Skullcap - threatened (1939)

*Preferred habitat:* dry rocky soil, low woods and fields, usually on basic soils.

*Sources:*

Tatnall, R.R. 1946. Flora of Delaware and the Eastern Shore: an annotated list of the ferns and flowering plants of the peninsula of Delaware, Maryland, and Virginia. Soc. Nat. Hist. Del. (Address not given).

Radford, A.E., H.E. Ahles, and C.R. Bell. 1964. Manual of the vascular flora of the Carolinas. University of North Carolina Press, Chapel Hill.



## Appendix E: Leadership in Energy and Environmental Design LEED™ Version 2.1 Project Checklist

Project Name: \_\_\_\_\_

Tax ID: \_\_\_\_\_

Address: \_\_\_\_\_

For more information regarding LEED™, refer to the US Green Building Council website at <http://www.usgbc.org>

Yes ? No

			<b>Sustainable Sites</b>	<b>14 Points</b>
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<b>Y</b>			Prereq 1	<b>Erosion &amp; Sedimentation Control</b>	Required
			Credit 1	<b>Site Selection</b>	1
			Credit 2	<b>Urban Redevelopment</b>	1
			Credit 3	<b>Brownfield Redevelopment</b>	1
			Credit 4.1	<b>Alternative Transportation, Public Transportation Access</b>	1
			Credit 4.2	<b>Alternative Transportation, Bicycle Storage &amp; Changing Rooms</b>	1
			Credit 4.3	<b>Alternative Transportation, Alternative Fuel Vehicles</b>	1
			Credit 4.4	<b>Alternative Transportation, Parking Capacity and Carpooling</b>	1
			Credit 5.1	<b>Reduced Site Disturbance, Protect or Restore Open Space</b>	1
			Credit 5.2	<b>Reduced Site Disturbance, Development Footprint</b>	1
			Credit 6.1	<b>Stormwater Management, Rate and Quantity</b>	1
			Credit 6.2	<b>Stormwater Management, Treatment</b>	1
			Credit 7.1	<b>Landscape &amp; Exterior Design to Reduce Heat Islands, Non-Roof</b>	1
			Credit 7.2	<b>Landscape &amp; Exterior Design to Reduce Heat Islands, Roof</b>	1
			Credit 8	<b>Light Pollution Reduction</b>	1

Yes ? No

			<b>Water Efficiency</b>	<b>5 Points</b>
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			Credit 1.1	<b>Water Efficient Landscaping, Reduce by 50%</b>	1
			Credit 1.2	<b>Water Efficient Landscaping, No Potable Use or No Irrigation</b>	1
			Credit 2	<b>Innovative Wastewater Technologies</b>	1
			Credit 3.1	<b>Water Use Reduction, 20% Reduction</b>	1
			Credit 3.2	<b>Water Use Reduction, 30% Reduction</b>	1

Yes	?	No					
			<b>Energy &amp; Atmosphere</b>				<b>17</b> Points
Y			Prereq 1	<b>Fundamental Building Systems Commissioning</b>		Required	
Y			Prereq 2	<b>Minimum Energy Performance</b>		Required	
Y			Prereq 3	<b>CFC Reduction in HVAC&amp;R Equipment</b>		Required	
			Credit 1	<b>Optimize Energy Performance</b>		1 to 10	
			Credit 2.1	<b>Renewable Energy, 5%</b>		1	
			Credit 2.2	<b>Renewable Energy, 10%</b>		1	
			Credit 2.3	<b>Renewable Energy, 20%</b>		1	
			Credit 3	<b>Additional Commissioning</b>		1	
			Credit 4	<b>Ozone Depletion</b>		1	
			Credit 5	<b>Measurement &amp; Verification</b>		1	
			Credit 6	<b>Green Power</b>		1	
Yes	?	No					
			<b>Materials &amp; Resources</b>				<b>13</b> Points
Y			Prereq 1	<b>Storage &amp; Collection of Recyclables</b>		Required	
			Credit 1.1	<b>Building Reuse</b> , Maintain 75% of Existing Shell		1	
			Credit 1.2	<b>Building Reuse</b> , Maintain 100% of Shell		1	
			Credit 1.3	<b>Building Reuse</b> , Maintain 100% Shell & 50% Non-Shell		1	
			Credit 2.1	<b>Construction Waste Management</b> , Divert 50%		1	
			Credit 2.2	<b>Construction Waste Management</b> , Divert 75%		1	
			Credit 3.1	<b>Resource Reuse</b> , Specify 5%		1	
			Credit 3.2	<b>Resource Reuse</b> , Specify 10%		1	
			Credit 4.1	<b>Recycled Content</b> , Specify 5% (post-consumer + ½ post-industrial)		1	
			Credit 4.2	<b>Recycled Content</b> , Specify 10% (post-consumer + ½ post-industrial)		1	
			Credit 5.1	<b>Local/Regional Materials</b> , 20% Manufactured Locally		1	
			Credit 5.2	<b>Local/Regional Materials</b> , of 20% Above, 50% Harvested Locally		1	
			Credit 6	<b>Rapidly Renewable Materials</b>		1	
			Credit 7	<b>Certified Wood</b>		1	

Yes ? No

			<b>Indoor Environmental Quality</b>	<b>15</b> Points
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Y				Prereq 1 <b>Minimum IAQ Performance</b>	Required
Y				Prereq 2 <b>Environmental Tobacco Smoke (ETS) Control</b>	Required
				Credit 1 <b>Carbon Dioxide (CO<sub>2</sub>) Monitoring</b>	1
				Credit 2 <b>Ventilation Effectiveness</b>	1
				Credit 3.1 <b>Construction IAQ Management Plan, During Construction</b>	1
				Credit 3.2 <b>Construction IAQ Management Plan, Before Occupancy</b>	1
				Credit 4.1 <b>Low-Emitting Materials, Adhesives &amp; Sealants</b>	1
				Credit 4.2 <b>Low-Emitting Materials, Paints</b>	1
				Credit 4.3 <b>Low-Emitting Materials, Carpet</b>	1
				Credit 4.4 <b>Low-Emitting Materials, Composite Wood &amp; Agrifiber</b>	1
				Credit 5 <b>Indoor Chemical &amp; Pollutant Source Control</b>	1
				Credit 6.1 <b>Controllability of Systems, Perimeter</b>	1
				Credit 6.2 <b>Controllability of Systems, Non-Perimeter</b>	1
				Credit 7.1 <b>Thermal Comfort, Comply with ASHRAE 55-1992</b>	1
				Credit 7.2 <b>Thermal Comfort, Permanent Monitoring System</b>	1
				Credit 8.1 <b>Daylight &amp; Views, Daylight 75% of Spaces</b>	1
				Credit 8.2 <b>Daylight &amp; Views, Views for 90% of Spaces</b>	1

Yes ? No

			<b>Innovation &amp; Design Process</b>	<b>5</b> Points
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				Credit 1.1 <b>Innovation in Design: Provide Specific Title</b>	1
				Credit 1.2 <b>Innovation in Design: Provide Specific Title</b>	1
				Credit 1.3 <b>Innovation in Design: Provide Specific Title</b>	1
				Credit 1.4 <b>Innovation in Design: Provide Specific Title</b>	1
				Credit 2 <b>LEED™ Accredited Professional</b>	1

Yes ? No

			<b>Project Totals (pre-certification estimates)</b>	<b>69</b> Points
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**Certified** 26-32 points   **Silver** 33-38 points   **Gold** 39-51 points   **Platinum** 52-69 points